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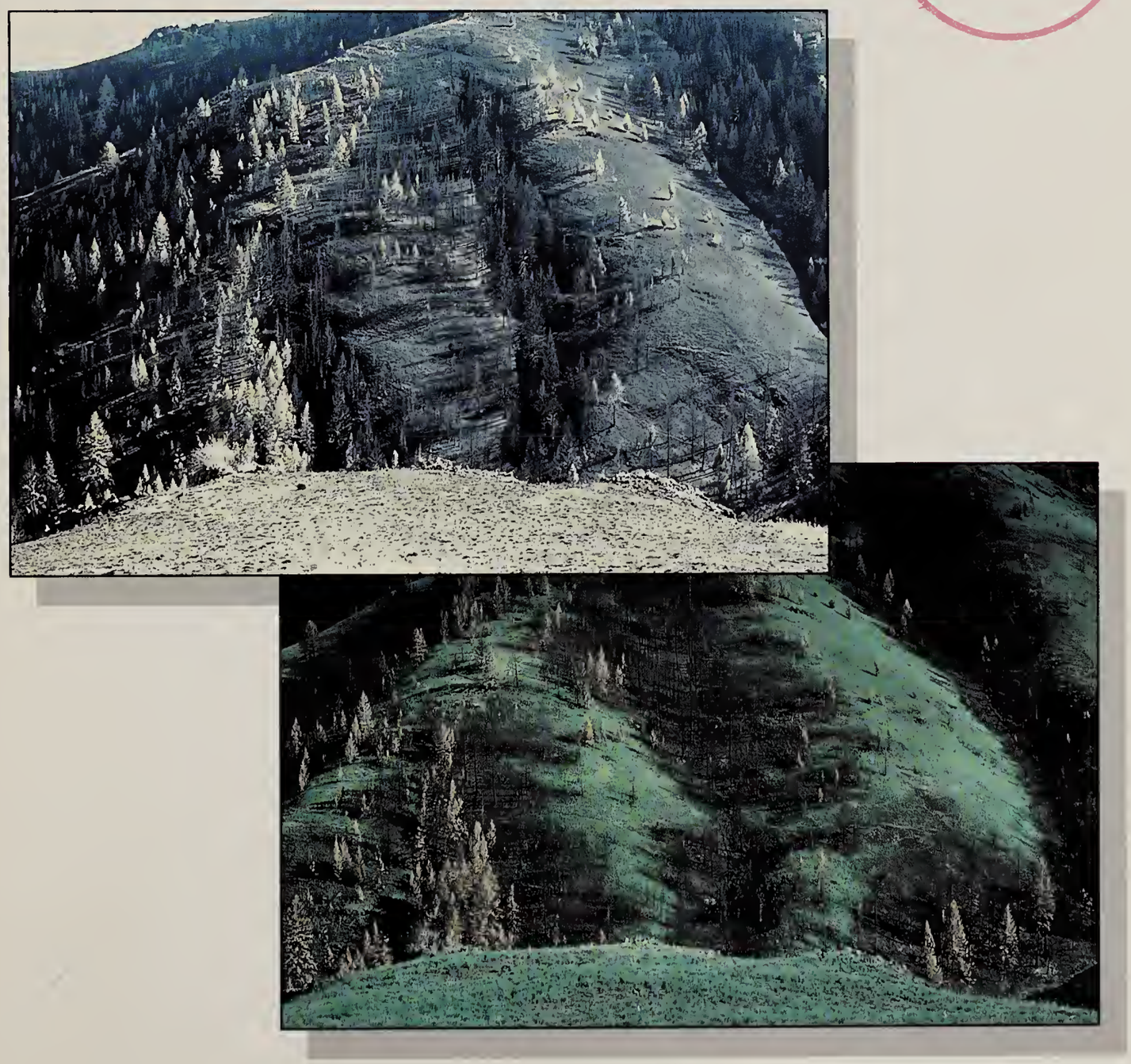
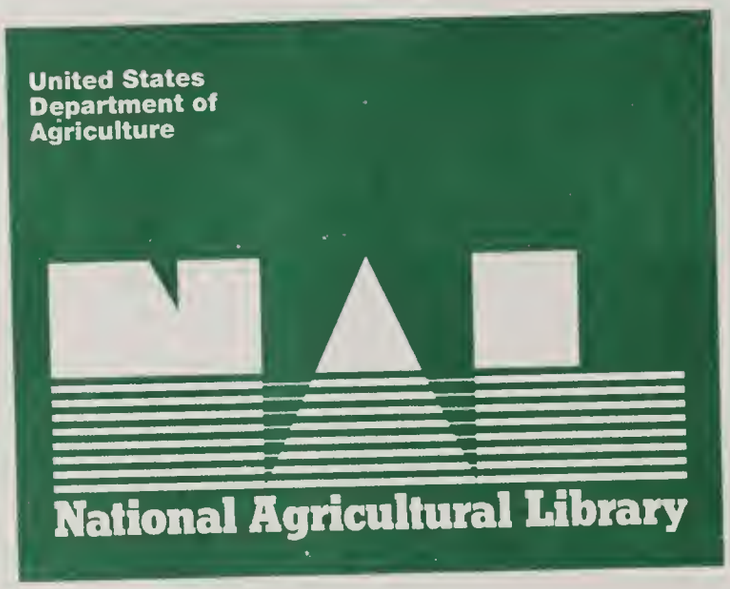
# Vegetation Response after Wildfires in National Forests of Northeastern Oregon

Charles Grier Johnson, Jr.



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# TABLE of CONTENTS

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Over the years since 1986 many people have contributed time, talents, and interest in this study. I would like to acknowledge as many as I can for their assistance in this undertaking.

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Many have assisted in the field with plot establishment and sampling of vegetation from 1986 to 1995. The following list is as complete as I can make it; recognizing that some names may have been inadvertently omitted:

| | | |
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Charlie Johnson
Baker City, Oregon

# INTRODUCTION

## Fire -- Natural Disturbance; Rejuvenating Event

Fire was once an integral function of the majority of ecosystems in northeastern Oregon, adjacent Idaho, and southeastern Washington. The seasonal cycling of fire across the landscape was as regular as the August and September lightning storms plying across the canyonlands and mountains. Depending on the plant community composition, structural configuration, and buildup of dead plant biomass, fire resulted from the ignitions with varying intensities and extension across the landscape. The shorter the return interval between fire events, the less dramatic would be the changes in plant composition. With infrequent return intervals, plant communities tended to burn more severely and be replaced by vegetation different in composition, structure, and age (Johnson, et al. 1994).

## Fire periodicity in the Blue and Wallowa Mountains

The past decade has resulted in fires of larger size burning at higher intensities than had occurred previously in this century in northeastern Oregon. In the warmer, drier Blue Mountain forests, the tree component has changed from domination by fire-dependant species to dense undergrowth of fire- susceptible species. Because fire has not been permitted to perform its natural role of frequent underburning (ponderosa pine-dominated stands) or replacement burning (fir-dominated stands), forest vigor has diminished. This has contributed to frequent outbreaks of insects and disease epidemics that have further increased the probability of large stand replacing fires (Hall 1980).

This contrasts sharply with the likelihood that the majority (80%) of Blue Mountain forests historically burned at low severity. Only 5% burned with high severity; the remainder (15%) burned moderately (Agee 1996). The burn intensities in the forest plots of this study are indicative of the trend toward higher severity burns. This is based on the drier climate of the past decade, the buildup of fuels, and dense stocking with fire-promoting sapling, pole, and intermediate-size trees. Had fire performed at regular intervals, there would have been a greater number of moderate and light burn intensities on the plots. Interestingly, of the 73 forested plots used in this study, 68% were severely burned, 21% were moderately burned and 11% burned lightly. A comparison of burn intensities estimated by Burned Area Rehabilitation specialists from BAER reports for the largest fires in the study area provided this interesting comparison:

Blue Mountain Fires - low = 33%, medium = 23%, high = 44%

Wallowa Mtn. Fires - low = 33%, medium = 44%, high = 23%

Canyonland Fires - low = 80%, medium = 6%, high = 14%

This comparison portrays the study area's fire characteristics well. The lowest-intensity burns would occur in the shrub and grass-dominated canyonlands. The highest-intensity burns would be in the drier montane ecosystems of the Blue Mountains while the Wallowas would be intermediate between the Blues and the canyons. Based on Agee's estimate of historic burn intensities above, all three areas have burned recently with much greater intensities than in the historic past.

The lengthening of fire intervals has contributed to fires burning more severely in communities where fire once passed through with less severity owing to lighter fuels. Deep-rooted tree species such as ponderosa pine, Douglas-fir and western larch are considered "fire seral" species that withstand heat and charring. But as the fire frequency is lengthened, a greater accumulation of duff occurs beneath the tree canopies. As a result, the deep-rooted trees develop fine roots that are oriented closer to the surface in the mineral soil. Now even some low-intensity burns can pose an increased risk of high tree mortality because the duff concentrates lethal heat for a longer duration and kills surface roots (Scott, et al. 1996; Agee 1993).

## Fire Resistance

The vegetation of the Blue Mountains is highly adapted to periodic fire in forest, shrubland, and grassland ecosystems. Flanagan (1996) rated the principal tree species into categories of resistance. The trees occurring in the Blues, Wallowas, and Seven Devils rate as follows on his scale:

very high resistance - western larch

high resistance - ponderosa pine and Douglas-fir
moderate resistance - grand fir
low resistance - lodgepole pine, whitebark pine, subalpine fir, Engelmann spruce

Agee (1996) categorized the ability of plants to survive fires using the plant's survival strategies following fire. A group of trees easily killed by fire were termed "avoiders." Examples are western juniper, grand fir, subalpine fir, Engelmann spruce and whitebark pine. Trees capable of surviving low-intensity fires were termed "resisters." Examples include ponderosa pine, Douglas-fir, and western larch. A tree capable of resprouting from the base after top-kill was termed an "endurer." An example is quaking aspen. A tree that is killed but reproduces from a seed bank is called an "evader." Lodgepole pine is our best example.

The adaptations that enable the vegetation to survive, increase site occupancy, and to attain renewed vitality are as varied as our flora. The following is provided as a sample of common plants with their adaptations taken from Agee (1996):

Thick bark enables ponderosa pine, Douglas-fir, and western larch to sustain moderate and light underburns. Shrubs that sprout from rootcrowns and rhizomes are snowberries, ninebark, Scouler willow, huckleberries, and rabbitbrushes. Grasses with perennating buds protected in foliage of their crowns are bluebunch wheatgrass and Sandberg's bluegrass. Plants that require the heat from burning duff to scarify their thick seedcoats are snowbrush ceanothus and lupines. And windblown seed from fireweeds allow for rapid site invasion from adjacent unburned areas.

Root systems and where they are situated in the substrate often determine the ability of a plant species to survive. McLean (1969) provided a resistance rating for shrubs and herbaceous plants. It is exemplified by some plants common to many plots of this study.

resistant (taproots or fibrous roots with rhizomes 5-13 cm. deep) e.g., snowbrush ceanothus, birchleaf spiraea

intermediate (shallow rhizomes) e.g., pinegrass, creeping Oregon-grape, heartleaf arnica

susceptible (rhizomes in duff, shallow fibrous roots and stolons) e.g., sidebells pyrola, twinflower

Rangeland communities where woodlands, savannas, shrublands and grasslands regularly occur are composed of species with varying responses to burning. Historically rangelands have been visited by fires on frequent return intervals. As with forest stands, there has been a decreased frequency of fires over the past century resulting primarily from human intervention. As a result there has been an increase in fire-susceptible plant species in rangelands. Similarly to the increase of firs in ponderosa pine-dominated forests, junipers and sagebrushes have increased in density and extent in sites where high-frequency burns once kept them subordinate to fire-adapted vegetation (Burkhardt & Tisdale 1976; Shinn 1980).

Plants found frequently in shrubland and grassland study plots had predictable responses to the varying fire intensities. An important source of fire effects information is in the "Fire Effects Information System" (Fischer, W.C. et al. 1996). As an example of the known responses to fire by some of the native species of importance in this study, the following listing is provided from Boyer and Dell (1980) and Strang (1989):

**mountain big sagebrush** - easily killed; resprouts on moist ground.
**antelope bitterbrush** - resprouts on moist ground; weak resprouter on dry sites.
**rabbitbrushes** - vigorous resprouter after fire.
**Idaho fescue** - susceptible to severe damage by fire owing to perennating buds located in the dense basal tufts where fire can burn hot and linger.
**bluebunch wheatgrass** - withstands fire well owing to open tufts.
**prairie junegrass** - tolerant and resistant to fire damage.
**Sandberg's bluegrass** - tolerant and often spreads to niches left by other plants eliminated by the burn.
**cheatgrass** - promoted by repeated burning and may increase in density.
**pinegrass** - very tolerant to fire; increases rapidly afterwards.

Ground surface features that exhibited changes with different fire intensities were litter, moss, lichen, and bare ground. Cryptogams often spread into the niches left by consumed vegetation (plants and litter). On the sites with light burning

the cryptogam layer was often unaffected. On moderately burned sites, mosses often showed dramatic increases in the first and fifth years after the burn. Conversely by the fifth year, on some sites quick to respond with herbaceous vegetation, cryptogams declined because of increased litter accumulations. On the severely burned sites, mosses and lichens often were killed, but the dead crust organisms continued to provide a stabilization for the soil by protecting from raindrop and wind erosion. This was observed by Johansen and Rayburn (1996) on the Arid Lands Reserve near Richland, Washington.

**Using Fire as a Tool**

Fire has been a governing factor in providing a rich mosaic of plant communities across the varied landforms of northeast Oregon. The haphazard nature of fire's pathway, periodicity, and ignitions provided various patch sizes, textures, and kinds of vegetation as a result. The probability of fire in any given place was a function of chance, the position on the landscape, and the vulnerability of the plant community to fire (Johnson 1994).

Today the unprecedented combination of decreased low-intensity surface fires, increased stand-replacing fires, and fire-exclusion management practices has resulted in a high percentage of plant communities vulnerable to crowning fires. This gives high probability of fires burning with a severity and pattern not previously experienced by some vegetation and may result in different successional pathways (Arno, et al. 1985).

As a result, reliance on prescribed natural fire to rectify this imbalance may not be desired by natural resource managers. Using management-ignited prescribed fire may be a more strategic way of re-incorporating fire into the ecosystems. In forests, the unprecedented buildup of down woody material along with the unprecedented dense understory layers may require silvicultural treatment in addition to landscape-scale burning to emulate effects of natural disturbances.

The effects of fire on trees, shrubs, and herbaceous vegetation will depend on fire intensity, which is a function of the season and the climatic pattern occurring at the time of the fire. Vegetation response will also be affected by key factors linked to the growing season following the burn: plant germination and sprouting along with the use of emerging vegetation by animals (Bunting 1996). Not only is plant vigor improved by fire along with plant community diversity, but forage production and palatability for ungulates are often improved as well (Adams 1989). Elk increases in the past 20 years have accentuated early spring use on gramineous plants throughout northeastern Oregon. As prescribed fires create earlier seral stages of vegetation across the mountainous and canyon landscapes, elk will be attracted to the succulent vegetation of the burns. Having larger prescribed burn units may spread the use by elk and mitigate this problem of concentrated use on emergent vegetation. Land managers should take into account the ungulate response when determining the scale of prescribed fire projects.

## A SUMMARY OF FINDINGS

Fires are haphazard in where they burn and how severely they burn and therefore enhance biological diversity by providing for varied structure and species composition across a landscape.

- Fire severities influence the ability of a species to compete, invade, or maintain its presence/dominance on a given site.

- Fire is a natural ecosystem process that has always affected the organisms in the inland Pacific Northwest in a cyclic manner.

- The curtailment of wildfires has enabled virtually all plant communities to have greater biomass and less vigorous vegetative growth, with resultant vulnerability to pathogenic organisms and wildfires of greater severity and size.

**Forests**

Subalpine Fir Series - All tree species were negatively affected by stand replacement burning in the first 5 years except for lodgepole pine. Most shrubs associated with subalpine fir plant associations showed a resilience by the fifth year. Shrub species not prominent in late seral stages of subalpine fir communities were becoming prominent in the early fire seres (e.g., black elderberry, Scouler willow). In the herbaceous layer, later seral species declined or were eliminated by the fire (e.g., sidebells pyrola). Other species were enhanced by moderate to severe burns (e.g., heartleaf arnica). Pioneers on severe burns

(e.g., fireweeds, pearly everlasting) were rapid colonizers providing protective ground cover.

Grand Fir Series - Grand fir succumbed to the moderate and severe burns. After 5 years, fire seral tree species (e.g., lodgepole pine, western larch, Douglas-fir) were occupying sites in the cool, moist grand fir plant associations. On moderate and severe burns, in the warm, dry grand fir plant associations, ponderosa pine was an important fire seral species after five years. On these drier sites grand fir had not returned in the fifth year. Shrubs capitalizing on severe burns in grand fir plant associations were snowbrush ceanothus, creeping Oregon-grape and Scouler willow. On drier grand fir plant associations grouse huckleberry was enhanced by moderate and severe burns. The herbaceous layer in cool, moist grand fir communities demonstrated increases by pinegrass, elk sedge and fireweeds following moderate and severe burns. On warmer, drier grand fir sites, pinegrass, elk sedge, and mountain brome increased with moderate and severe burns. Prominent forbs that responded to the severe burns on warm, dry grand fir sites were bull thistle, fireweeds, and lupines.

Douglas-fir Series - Severe burns were detrimental to tree retention in the first 5 years. However moderate and light burns retained Douglas-fir and enhanced ponderosa pine occupancy. Shrubs were resilient to severe burns and increased dramatically in the fifth year (e.g., ninebark, spiraea, snowberry). Redstem and snowbrush ceanothus entered Douglas-fir sites following severe burns. Pinegrass and western fescue were prominent increasers with moderate and severe burns. Compared with true fir plant associations, which occupy cool, moist environments, Douglas-fir plant associations are warmer and drier. Therefore, pinegrass was negatively influenced on Douglas-fir sites in all fire severities the first year after the fire but responded vigorously with increases by the fifth year. Elk sedge was negatively influenced by severe burns in Douglas-fir plant associations. Forbs responding well to moderate and severe burns were strawberries, mitella, fireweeds, yarrow, and cleavers.

Ponderosa Pine Series - Severe burns eliminated ponderosa pine from the site the first 5 years after the fire. At the other extreme, light burns enhanced ponderosa pine communities with reduction of duff and establishment of seedlings. Of the shrub species associated with ponderosa pine plant associations, common snowberry responded vigorously after 5 years. On severe burns pinegrass, fireweeds, yarrow, and annual bromes were promoted. Light burns increased lupine, pinegrass, Idaho fescue, and annual bromes.

**Shrublands**

Severe burns promoted ninebark on cool, moist sites, but spiraea and common snowberry were negatively affected. On big sagebrush sites moderate and severe burns were detrimental to mountain big sagebrush, mountain snowberry, and rabbitbrushes the first year after the fire. However, by the fifth year these shrubs were responding vigorously with prominent occupancy of the sites. Mountain mahogany was negatively affected by severe burning but withstood moderate burns. Grasses responding favorably to moderate and severe burns were pinegrass, bluebunch wheatgrass, and annual bromes. For the most part, the apparent duration of fire in the shrublands was injurious to Idaho fescue. Forbs of prominence in shrublands, with a positive response to severe burning, were miner's lettuce and heartleaf arnica. Moderate burning promoted goatweed in fifth-year samples taken in low elevation shrublands.

**Grasslands**

Bluebunch Wheatgrass Series - Light and moderate burns enhanced bluebunch wheatgrass but severe burns negatively affected that species. Sandberg's bluegrass was quick to colonize new sites the first year after severe and moderate burns, but was unable to enhance its occupancy on light burns. Annual bromes were quick to increase the first year on light to moderate burns but declined on severely burned sites. By the fifth year, annual bromes were showing increases on severely burned sites. Arrowleaf balsamroot was the consistent increaser among forbs in bluebunch wheatgrass communities the first year after moderate to severe burns.

Idaho Fescue Series - Among the bunchgrasses, Idaho fescue demonstrated the greatest vulnerability to moderate and severe burns (especially the first year after the fire). By the fifth year, it was generally increasing in

coverage on lightly burned sites and on low-elevation sites burned moderately or severely in the Idaho fescue - prairie junegrass plant association. In other Idaho fescue plant associations it was still negatively affected 5 years after the fires. Prairie junegrass demonstrated increases the first year after burns in Idaho fescue communities but declined by the fifth year owing to competition from annual bromes or bluebunch wheatgrasses. Forbs negatively affected by burns in Idaho fescue communities the first five years were twin arnica, arrowleaf balsamroot, and red avens. Annual forbs notably enhanced by fire in these communities after 5 years were tall annual willowweed and prickly lettuce.

**Ground Cover**

Following severe burns the ground was generally devoid of standing biomass. Even moderate burns tended to leave a high percentage of the sites with bare ground or ash. However, this was of short duration in the plant associations of northeastern Oregon. By the first year following the most severe burn, mosses, liverworts, and pioneering forbs (e.g., fireweeds) assisted in the rapid rehabilitation of the biotic community. The principal coverage of bare ground immediately following the fires in forested sites was by needle fall from moderately burned trees. On light burns the discontinuous nature of the fire left the ground surface with unburned litter for ground protection on portions of the sites. The following is a synopsis of results for forests, shrublands, and grasslands:

Forests - The year following the fire, litter generally declined from pre-burn coverages. Then, by the fifth year, litter coverage was often nearly returned to pre-burn levels. In grand fir and subalpine fir plant associations the burn was usually severe. Here shrubs, sedges, forbs, and grasses were totally consumed along with down woody material. The response by fire liverworts and mosses the year after the severe burns was dramatic (e.g., 50% liverwort cover in grand fir/beadlilly plant communities; 0% liverwort cover by year five).

Shrublands - Litter and bare ground percentages traded places predictably from year one (bare ground cover highest) to year five (litter cover highest). Mosses and lichens tended to be in pre-burn and post-burn shrub communities with low coverages.

Grasslands - Following severe and moderate burns, litter was diminished by consumption of both the standing biomass and the litter on the ground. By the fifth year it often exceeded the pre-burn levels owing to additional biomass from annuals. In the rocky sites where bluebunch wheatgrass plant associations often occur, the cryptogams (mosses and lichens) are especially prevalent. Mosses and lichens were often bypassed by the flames on these sites. Heat, however, did cause mortality and decreases in post-burn cover of living mosses and lichens. The dead cryptogam layer did provide protection to the soil from erosive agents. On fescue sites mosses and lichens often surrounded bunchgrass tufts as occupants of the cooler, moister micro-environment provided by the bunchgrass foliage. Here, beneath the bunchgrasses, cryptogam mortality was greater than in the drier bluebunch wheatgrass communities.

## HISTORY OF THE STUDY

In 1986 a rash of wildfires occurred across a wide area of the Blue and Wallowa Mountains and adjacent canyonlands of northeastern Oregon. The fires, starting in August and coupled with dry vegetation, produced burns of larger sizes and greater severities than had been the historic norm. As a result, a fire effects study was initiated by Deputy Forest Supervisor Joe Stockbridge for the fires of the Wallowa-Whitman National Forest.

One of the underpinnings of the study was that many ecology plots and rangeland condition and trend transect clusters (C&T) pre-dating the fires were located on the largest burn of the 1986 fires. Plots established from 1978 and C&T clusters dating from 1959 to 1965 were plentiful across the Joseph-Starvation Burn complex. In both cases vegetation cover data by species and photographs taken from fixed camera points recorded the plant communities prior to the burn.

Where plots did not exist, plots and camera points were established as reference points for following the succession of plants after the fire.

The study was designed with three phases as follows:

Phase 1 - Observations were made soon after the fire-fighting activity had culminated. The extent and severity of the burn at the site was recorded. If not already existing, fixed camera points and plots were established at this time.

Phase 2 - The first growing season following the fire, vegetation response was documented by sampling plant composition using the techniques employed previously. Photographs were taken from the permanent camera points to compare with pre-burn photographs.

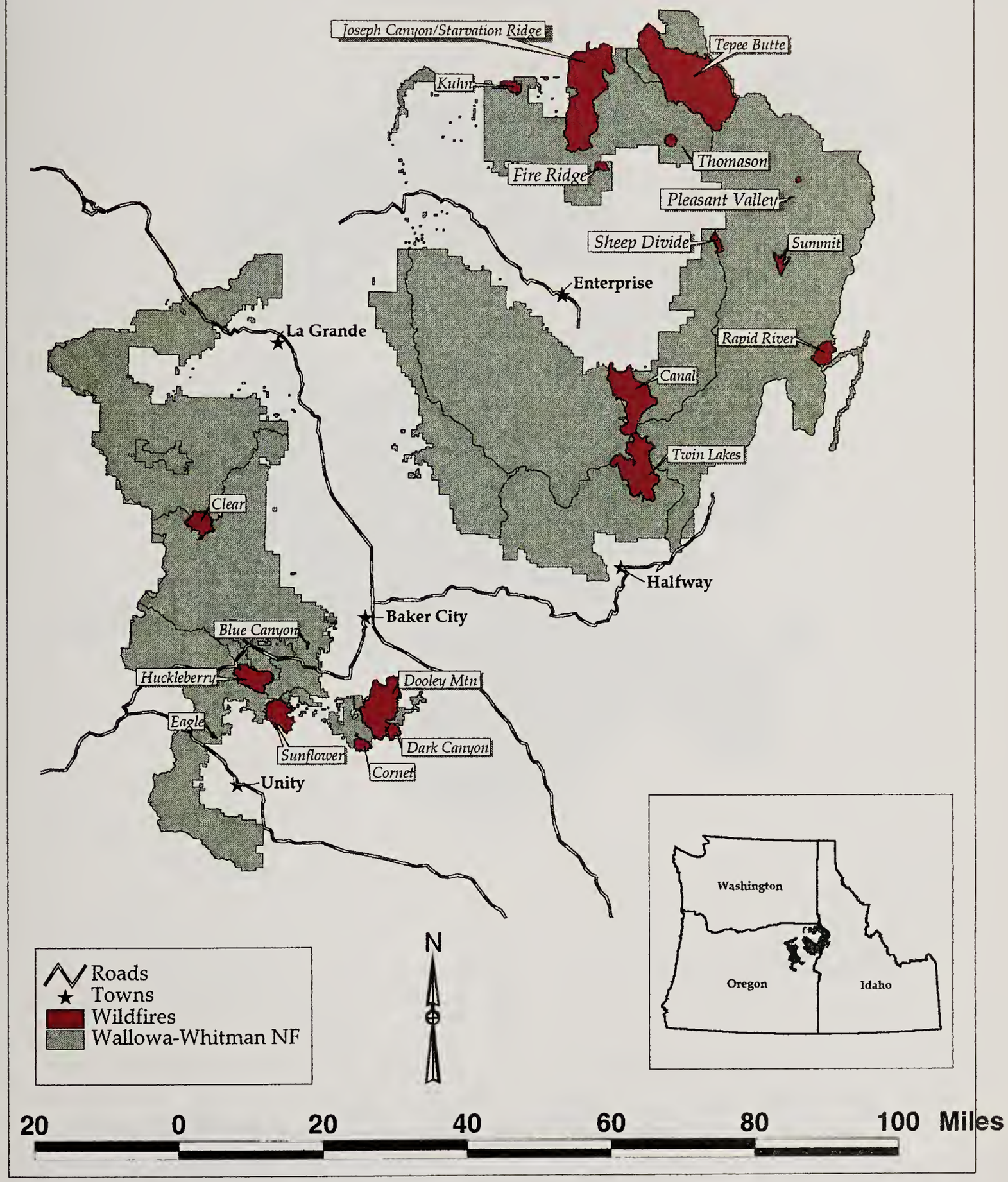
Phase 3 - This was the vegetative trend phase. Sampling and photo documentation occurred the fifth year after the "first year" sampling and was planned for 5-year intervals as long as it was determined to be feasible.

Photography was/is a hallmark of this study. Liberal use of the camera resulted in both general landscape views and specific plot views. In the case of plots established after the fire, photography taken immediately after the burn served as the benchmark.

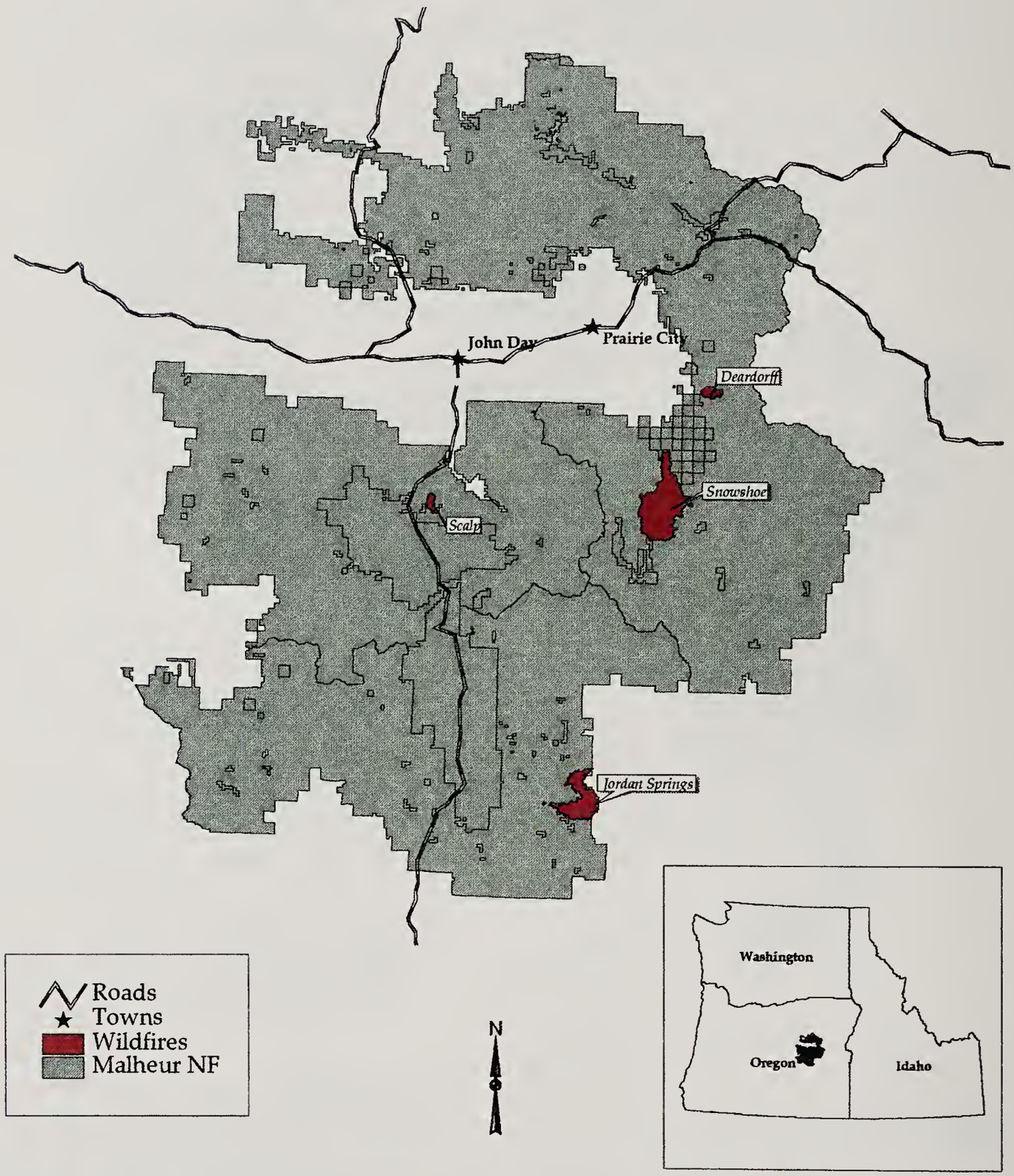
It was envisioned that following the fifth year, findings would be disseminated. However, large fires occurred on the three Forests in 1987, 1988, 1989 and 1990. The study was expanded to encompass those fires in order to re-sample plots that pre-existed on the Umatilla and Malheur National Forests.

The fires used in the study can be found in appendices C & D. They are organized by year, Forest, and Ranger District, and include a brief capsulized history. The locations of the fires can be found on maps of each National Forest on the following pages.

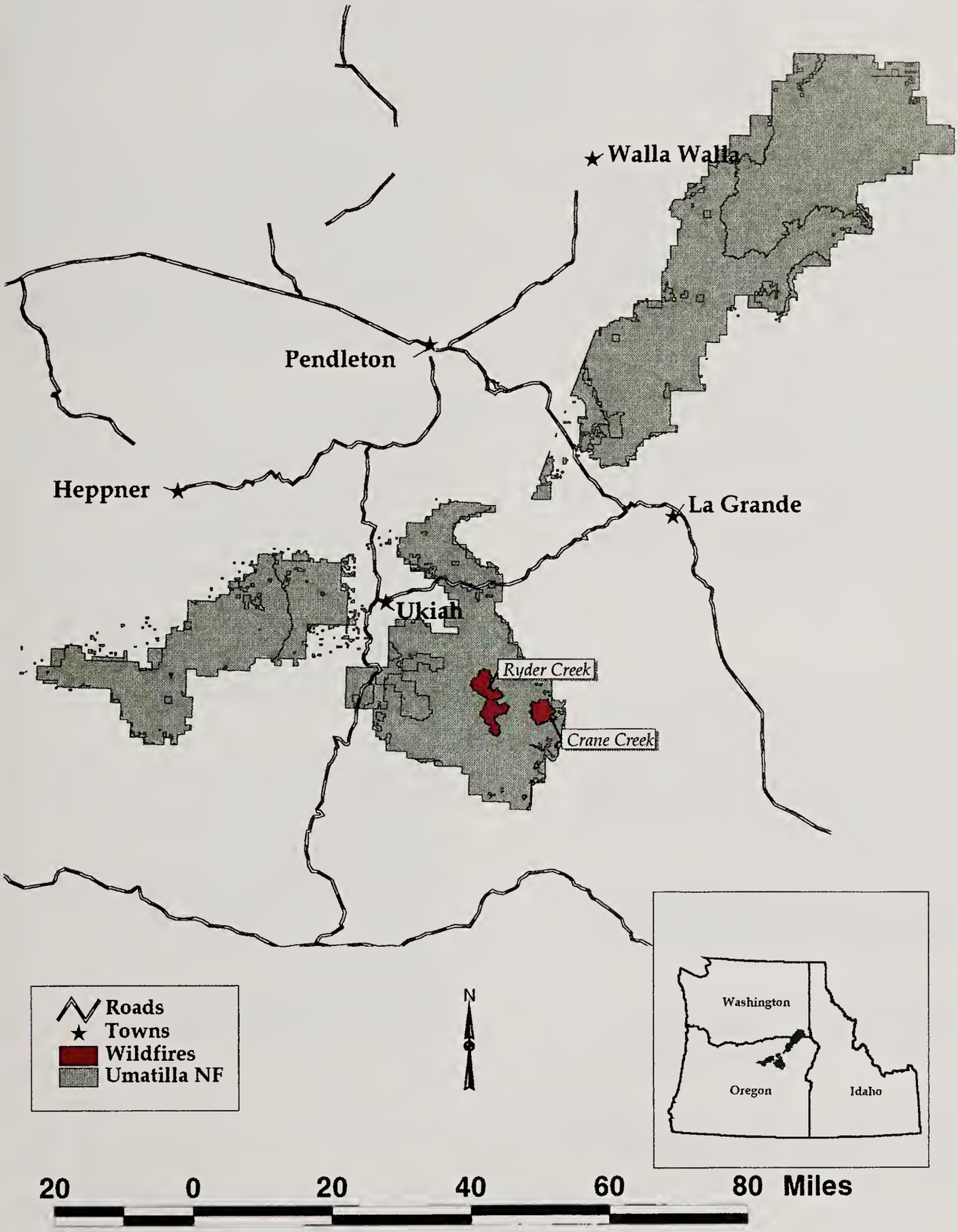
# Wallowa-Whitman National Forest Wildfires



# Malheur National Forest Wildfires



# Umatilla National Forest Wildfires



The following table provides a summary of the sampling of 1986 - 1994 burns:

| Burn Year | No. of Fires | No. of Plots |
|---|---|---|
| 1986 | 18 | 75 |
| 1987 | 2 | 7 |
| 1988 | 1 | 48 |
| 1989 | 3 | 20 |
| 1990 | 1 | 6 |
| 1994 | 5 | 29 |
| **TOTAL** | **30** | **185** |

Thirty fires were included in this study. A total of 185 plots provided information for the comparative analysis. Usually the plots were re-sampled the first and fifth years following the burn. One burn (Deardorff) was resampled in the 8th year instead of at year five. Plots located on the 1990 and 1994 burns have only been read once (since their fifth anniversary has not yet arrived).

Plots were resampled as either 375-sq.-meter circular fixed areas (nearly a tenth-acre) or as 1-square-foot quadrats located at specific settings along transects. In all cases the sampling replicated the past sampling technique. For burns lacking pre-existing plots, areas were selected that were considered representative for the burn severities that characterized the fire and that included the dominant vegetation.

**Burn Severity**

Burn severity has been categorized as "low, moderate, and high" (Agee 1993); "low, medium, and high" (Morrison and Swanson 1990); "light, moderate, and severe" (Boyer and Dell 1980); "light, moderate, and heavy" by Ryan and Noste (1985); and by the National Park Service (1992) as "unburned, scorched, lightly burned, moderately burned, and heavily burned."

The burn severities used in this study, and written as categories within each plant association, are defined as follows:

Partial Burn (mosaic)
The plot area contained a mixture of burn severities with no one severity dominating.

Light Burn

***Forest Vegetation***: leaves and twigs on tree branches partially to completely scorched; mature trees mostly underburned

***Shrublands/grasslands***: shrubs with some singed/consumed leaves, but majority unscathed; grasses with standing culms (singed or blackened); and tufts with surface char at most.
***Cryptogams***: unscathed
***Substrate***: litter charred to partially consumed in forest communities; litter unscathed or partly consumed in grasslands

Moderate Burn

***Forest Vegetation:*** leaves and small twigs on tree branches completely scorched; stems and tree trunks charred and partially burned
***Shrublands and grasslands***: shrubs with consumed and singed leaves, stems blackened; grasses with culms consumed or blackened; tufts charred with unburned crown.
***Cryptogams***: partially burned or scorched
***Substrate***: litter and woody debris partially consumed and logs blackened in forest communities; litter partially consumed in grasslands and shrublands

Severe Burn

***Forest Vegetation***: all leaves, stems and twigs on tree branches consumed; trees and tree trunks deeply charred with branches mostly consumed.
***Shrublands and grasslands***: shrubs consumed with only blackened stubs above the ground surface; grasses with culms consumed; tufts consumed or crown blackened.
***Cryptogams***: blackened or consumed
***Substrate***: litter and duff consumed; white ash prevalent; logs deeply charred or consumed.

## PLANT ASSOCIATIONS AND FIRE'S EFFECTS

The following constitutes the summary of fire's effects, by burn severity, to key plant associations of the Wallowa and Blue Mountains and associated canyonlands. The format is repetitive in a sequence that leads from grasslands to forests.

Changes are noted from pre-burn through the first and/or fifth years following the fires and tables of percentage cover of key plant species are provided. Since the sample size is often quite small, the mean provided is also accompanied by the range of values. The small sample size is a result of a fire happening to occur where a pre-existing plot was located. Following the text and table for each plant association, pictures are presented exemplifying the changes on a representative plot.

## Bluebunch wheatgrass - Sandberg's bluegrass (Basalt) plant association (AGSP-POSA3)

Two plots were available in this plant association predating the Joseph-Starvation Burn of 1986. One plot was burned severely; the other was burned moderately. Both plots were on steep southerly slopes (avg.= 69%) at elevations of 4200 ft and 4540 ft. The vegetation was resampled the first (1987) and fifth (1991) years after the burn.

### Severe burn findings

Bluebunch wheatgrass declined from 35% prior to the burn to 20% five years after the burn. Sandberg's bluegrass also declined. The only other plants to decline were western yarrow and lupine. Increasing with this severe burn were annual bromes (cheatgrass, soft chess, rattlesnake brome, and Japanese brome); arrowleaf balsamroot; and yellow salsify.

Entering the community for the first time following the burn were tall annual willowweed, prickly lettuce, and narrow-leaved skullcap. Litter increased and bare ground declined over the five years. Cryptogams increased on the plot area.

### Moderate burn findings

Bluebunch wheatgrass increased from a pre-burn 13% to 20% coverage five years after the burn. Sandberg's bluegrass increased from 4% to 12%. Showing declines over the five years were western yarrow and annual bromes. Lupine increased slightly. Entering the site for the first time after the burn were arrowleaf balsamroot, prickly lettuce, tall annual willowweed and stork's bill.

Litter, bare ground, and mosses all declined over the period. Lichens made an entry in the fifth year at 4% cover.

### Summary

The severe burn was detrimental to both principal bunchgrasses whereas the moderate burn enhanced bluebunch wheatgrass in the community.

The lower coverages of bluebunch wheatgrass, Sandberg's bluegrass, and annual bromes in the fifth year on the moderately burned plot may be attributed to drought conditions coupled with grazing pressure from elk and cattle combined. It would seem reasonable that bunchgrasses and annual grasses would be stimulated by the moderate burn to higher coverages than those sampled. Notes taken to the possible effects of drought and early grazing by elk lend credibility to this possibility.

**Bluebunch wheatgrass - Sandberg's bluegrass (BASALT) plant association (AGSP-POSA3) (n=2)**

| Burn Intensity | --------Severe-------- (n=1) | | | --------Moderate-------- (n=1) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Grasses | | | | | | |
| bluebunch wheatgrass (AGSP) | *35 | 29 | 20 | 13 | 18 | 20 |
| Sandberg's bluegrass (POSA3) | 5 | 7 | 2 | 4 | 11 | 12 |
| annual bromes (BROMU) | 6 | 4 | 11 | 8 | 11 | 4 |
| Perennial Forbs | | | | | | |
| western yarrow (ACMIL) | 10 | 4 | 3 | 5 | 1 | 2 |
| arrowleaf balsamroot (BASA) | 3 | 5 | 6 | 0 | 3 | 1 |
| lupines (LUPIN) | 3 | 1 | 1 | 1 | 1 | 3 |
| narrow-leaved skullcap (SCAN) | 0 | 1 | 1 | 0 | 0 | 0 |
| Annual Forbs | | | | | | |
| tall annual willowweed (EPPA) | 0 | 0 | 1 | 0 | 0 | 1 |
| stork's bill (ERCI) | 0 | 0 | 0 | 0 | 0 | 1 |
| prickly lettuce (LASE) | 1 | 0 | 1 | 0 | 0 | 1 |
| yellow salsify (TRDU) | 1 | 1 | 2 | 1 | 0 | 1 |
| Litter | 20 | 14 | 32 | 25 | 18 | 17 |
| Bare Ground | 30 | 18 | 7 | 33 | 26 | 22 |
| Moss | 0 | 1 | 1 | 12 | 4 | 6 |
| Lichen | 0 | 0 | 1 | 0 | 0 | 4 |

* Average Cover (%)

## AGSP-POSA3 (Basalt)

Plot 119 Established - 1978 Burned severely - 1986 Joseph-Starvation Fire
Horse Pasture Ridge, Wallowa Valley RD, Wallowa-Whitman National Forest

July 1978 – Bluebunch wheatgrass dominates (35%) with Sandberg's bluegrass subordinate (5%). Annual bromes are present at cover of 6%, yarrow (10%), and arrowleaf balsamroot (3%).

September 1986 – Burned continuously – all above-ground biomass consumed.

June 1987 – Bluebunch wheatgrass dominant (29%) with slight increase by Sandberg's bluegrass (7%). Annual bromes present at cover of 4%, yarrow (4%), and balsamroot (5%).

## Bluebunch wheatgrass - Sandberg's bluegrass - skullcap plant association (AGSP-POSA3-SCAN)

Two plots were available to portray the effects of fire in this plant association. One plot was moderately burned on the Joseph-Starvation burn of 1986. The other plot received a light partial burn from the Teepee Butte Fire of 1988. Both plots were on steep (avg. = 52%) southwest slopes. Elevations differed with the moderately burned plot located at 2840 ft. and the lightly burned plot at 3500 ft. Both plots pre-existed the burns and both were resampled in year one and year five following the fires. Both sites are rocky and gravelly averaging 35% cover by those features at the ground surface.

### Moderate burn findings

Bluebunch wheatgrass declined slightly over the 5-year period following the fire (18% to 14%). Skullcap was initially absent the year after the fire but had re-entered the site by year five. It was present at only a 1% cover after initially occurring at 10% prior to the fire. Annuals made large strides at colonization after the fire. Annual bromes (cheatgrass and rattlesnake brome) tripled; tall annual willowweed entered by the fifth year at 10% cover; and prickly lettuce increased on the site. Litter increased; bare ground declined; and cryptogams increased.

### Light burn findings

Bluebunch wheatgrass at first declined (24% to 16%) but by the fifth year had rebounded to 25%. Skullcap was constant at 5%. Increasing with the burn were Sandberg's bluegrass and annual bromes (rattlesnake brome and cheatgrass). Plants remaining constant throughout the period were yarrow, blepharipappus, and silky lupine. Litter increased; bare ground declined; and mosses decreased.

### Summary

The decline in bluebunch wheatgrass by the fifth year on the moderate burn may be attributed to ungulate grazing pressure. The loss of skullcap on the moderately burned site indicates the heat that is conducted through the rocks and gravels to effectively kill the skullcap plants growing within that medium.

With a normal fire cycle these communities would burn partially and lightly as exemplified by the Teepee Butte Burn plot. The moderate burning of the Joseph-Starvation plot's vegetation is more representative of absence of regular fire entry into the system.

**Bluebunch wheatgrass - Sandberg's bluegrass - skullcap plant association (AGSP-POSA3-SCAN) (n=2)**

| Burn Intensity | ---------Moderate--------- (n=1) | | | ---------Light--------- (n=1) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Grasses | | | | | | |
| bluebunch wheatgrass (AGSP) | ***18** | **24** | **14** | 24 | 16 | 25 |
| annual bromes (BROMU) | **3** | | **9** | 5 | 5 | 13 |
| Sandberg's bluegrass (POSA3) | **0** | **1** | **0** | 1 | 5 | 0 |
| Perennial Forbs | | | | | | |
| narrow-leaved skullcap (SCAN) | **10** | **0** | **1** | 6 | 6 | 5 |
| western yarrow (ACMIL) | **1** | **0** | **1** | 1 | 2 | 1 |
| silky lupine (LUSE) | **0** | **0** | **0** | 2 | 1 | 2 |
| Annual Forbs | | | | | | |
| tall annual willowweed (EPPA) | **0** | **0** | **10** | 0 | 0 | 1 |
| prickly lettuce (LASE) | **1** | **1** | **4** | 1 | 0 | 1 |
| blepharipappus (BLSC) | **1** | **0** | **0** | 1 | 1 | 1 |
| fiddleneck (AMRE2) | **0** | **0** | **0** | 0 | 1 | 12 |
| Litter | **28** | **No** | **47** | 50 | 15 | 59 |
| Bare Ground | **14** | **Data** | **10** | 17 | 42 | 7 |
| Moss | **1** | | **3** | 9 | 2 | 2 |
| Lichen | **0** | | **4** | 0 | 0 | 0 |

* Average Cover (%)

Plot 550 Established - 1981 Burned lightly - 1988 Teepee Butte Fire
Experiment Creek Canyon, Hells Canyon NRA, Wallowa-Whitman National Forest

**May 1981 – Bluebunch wheatgrass dominated (24% cover) with Sandberg's bluegrass present at 1%. Annual bromes provided a cover of 5%; skullcap (6%). Surface cover was litter (50%); mosses (9%), and bare ground (17%).**

**September 1988 – Partially burned by a light severity fire.**

June 1989 – Bluebunch wheatgrass remained dominant (16%). Sandberg's bluegrass increased from 1% to 5%. Skullcap and annual bromes remained constant. Surface cover changed dramatically - litter dropped to 15% cover; moss cover was reduced to 2%; and bare ground increased to 42%.

July 1995 – Bluebunch wheatgrass and Sandberg's bluegrass returned to pre-burn cover. Annual bromes almost tripled (25%) and occupied the bare ground following the burns. Skullcap remained constant.

## Bluebunch wheatgrass - Sandberg's bluegrass - prickly pear plant association (AGSP-POSA3-OPPO)

One plot was selected to study fire's effects on vegetation in this plant association. It was established prior to the Teepee Butte Fire of 1988. The plot was only partially burned (the area that did burn was of light severity). It was sampled in the first and fifth years following the burn. It is a south aspect with a slope of 26% at 3650 ft elevation.

Light burn findings

Bluebunch wheatgrass was enhanced by this light burn. It increased from a pre-burn cover of 8% to a fifth-year cover of 13%. Sandberg's bluegrass was constant throughout the period. Occupancy by prickly pear declined greatly. Annuals were the only other plants to increase from the light burn. Blepharipappus and annual bromes (cheatgrass and rattlesnake brome) each made small increases. Over the period, litter increased; bare ground declined; mosses declined, and lichens made a slight increase. Prickly pear is vulnerable to mortality from heat generated by the fires as well as by actual burning. However in most colonies some "pads" remained after the fire to serve as the initiators of future post-burn colonies.

**Bluebunch wheatgrass - Sandberg's bluegrass - prickly pear plant association (AGSP-POSA3-OPPO) (n=1)**

| Burn Intensity | --------Light--------- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Grasses | | | |
| bluebunch wheatgrass (AGSP) | *8 | 7 | 13 |
| Sandberg's bluegrass (POSA3) | 1 | 1 | 1 |
| annual bromes (BROMU) | 5 | 7 | 8 |
| Perennial Forbs | | | |
| prickly pear (OPPO) | 6 | 0 | 1 |
| Annual Forbs | | | |
| blepharipappus (BLSC) | 1 | 1 | 3 |
| Litter | 14 | 4 | 20 |
| Bare Ground | 11 | 11 | 3 |
| Moss | 53 | 28 | 27 |
| Lichen | 1 | 1 | 2 |

* Average Cover (%)

## AGSP-POSA3 (Basalt)
Plot 549

1981 – A bluebunch wheatgrass-dominated (mid-seral stage) community. Bluebunch wheatgrass cover was 8%; prickly pear cover was 6%. Mosses and lichens averaged 54%.

1988 – The fire burned lightly with standing culms and leaves of the bunchgrasses being consumed. Prickly pear pods were killed by the heat.

1989 – The first year after the fire, bluebunch wheatgrass rebounded to near pre-burn cover. Prickly pear was absent; killed in pre-fire colonies. Mosses and lichens were impacted by the heat of the fire; cover now was 28%.

AGSP-POSA3-OPPO

Plot 549 Established - 1981 Burned lightly - 1988 Teepee Butte Fire

Experiment Creek Canyon, Hells Canyon NRA, Wallowa-Whitman National Forest

May 1981 – Bluebunch wheatgrass dominated (8% cover) with Sandberg's bluegrass present at 1%. Prickly pear was prominent (6%). Annual bromes covered 5%. Surface cover by mosses was 53% on this rocky site.

September 1988 – Site was lightly and partially burned.

June 1989 – Bluebunch wheatgrass and annual bromes were co-dominant at 7% cover. Sandberg's bluegrass was constant at 1%. Prickly pear was killed by the burn. Mosses declined to a cover of 28%.

July 1995 – Bluebunch wheatgrass increased by the fifth year following the burn to 13%. Annual bromes, Sandberg's bluegrass, and mosses remained constant. Prickly pear germinated and constituted a cover of 1%.

## Sandberg's bluegrass - onespike oatgrass plant association (POSA3-DAUN)

Two plots established prior to the Thomason Burn of 1994 were used to study the effects of fire on the vegetation of this plant association. Both plots were very lightly burned with high percentages of the plot areas unscathed by the fire. Both were on broad, gentle ridgetops (slope avg.= 5%; aspects westerly). Elevations were 4540 ft and 4680 ft. The plots were resampled only the first year after the burn.

Light burn findings

Sandberg's bluegrass increased from 18% to 23% the first year following the burn. Onespike oatgrass did not fare as well. It declined from a pre-burn coverage of 13% to only 2% after the burn. Moss cover declined; lichens increased.

Other findings

Lanceleaved stonecrop and slenderfruit desert-parsley both made increases on the sites. These increases were attributed to disturbance in early spring when these scablands are saturated with winter snowmelt. Elk use these communities in early spring to graze on the early developing bluegrass leaves. Consequently the animals upturn the plants and leave hoof depressions, which become bare ground available as colonizing sites for the stonecrop and desert-parsleys. It is not clear that the bluegrass increases and the oatgrass decreases are attributable solely to the light burn; the impact of the elk may be partially responsible for some of the shifts.

**Sandberg's bluegrass - onespike oatgrass plant association (POSA3-DAUN) (n=2)**

| Burn Intensity | ---Light/Partial--- (n=2) | |
|---|---|---|
| **Species** | **PRE** | **1** |
| Grasses | | |
| Sandberg's bluegrass (POSA3) | ✳**18** | **23** |
| | ◆(6-30) | (21-25) |
| onespike oatgrass (DAUN) | **13** | **2** |
| | (11-15) | (1-3) |
| Perennial Forbs | | |
| lanceleaved stonecrop (SELA2) | **4** | **6** |
| | (3-5) | (1-10) |
| slenderfruit desert-parsley (LOLE) | **6** | **9** |
| | (5-6) | (3-15) |
| Litter | **4** | **3** |
| | (1-6) | (1-4) |
| Bare Ground | **2** | **1** |
| | (1-2) | (1-1) |
| Moss | **45** | **32** |
| | (31-60) | (25-39) |
| Lichen | **2** | **8** |
| | (0-3) | (7-10) |

✳ Average Cover (%)
◆ Range of Cover (%)

**POSA3-DAUN**

**Plot 173** **Established - 1979** **Burned lightly - 1994** Thomason Fire

Vance Knoll, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

**September 1994 – Partially burned with light severity.**

**June 1995 – Sandberg's bluegrass increased from 6% to 21% cover. Desert parsley also increased (6% to 15%). Onespike oatgrass declined significantly from a pre-burn cover of 11% to only 1% the year after the fire. This could be a reflection of soil moisture loss inhibiting oatgrass survival.**

## Idaho fescue - prairie junegrass (ridgetops) plant association (FEID-KOCR)

Four plots were used to study fire effects on vegetation belonging to the Idaho fescue-prairie junegrass plant association on ridgetop and upper slope positions. The plots are all located on the Joseph-Starvation burn of 1986 and pre-existed the fire. Vegetation on three plots burned moderately while the fourth plot was lightly burned. Two plots have northerly aspects and two have westerly aspects. Slopes where the plots are located are gentle (5% to 22%) with an average of 11%. The elevations range from 4300 ft to 5000 ft (avg.= 4625 ft). The plots were sampled the first year and fifth year after the burn.

Moderate burn findings

With the exception of a minor showing by rose, shrubs are absent from these communities.

The principal herbaceous species of this plant association are Idaho fescue, bluebunch wheatgrass, prairie junegrass, Sandberg's bluegrass, and silky lupine. Both Idaho fescue and bluebunch wheatgrass declined in the first five years after the burn. The fescue declined from 25% to 15%; the wheatgrass declined from 26% to 14%. The other bunchgrasses (Sandberg's bluegrass and prairie junegrass) maintained their cover at low levels (5%) from pre-burn to post-burn periods. Perennials showing slight declines as a result of the fire were yarrow; arrowleaf balsamroot; phlox; and silky lupine. Annual plants showing an increase the first year and then declining by the fifth year were: pale alyssum, shining chickweed, and yellow salsify. Plants maintaining a constant cover throughout the pre and post-burn periods were annual bromes (cheatgrass, rattlesnake brome, and Japanese brome), narrow-leaved collomia, and prickly lettuce. Tall annual willowweed made a dramatic increase in the fifth year following the burn. On one plot Kentucky bluegrass was prevalent before the burn (7%); tripled the first year after the burn (21%); and then declined to 9% in the fifth year.

With the moderate burn of these ridgetop communities, litter declined; bare ground increased and then declined; and cryptogams increased from pre-burn to post-burn periods.

Light burn findings

The light burn did not affect the cover of Idaho fescue (18%) but did cause a decline in bluebunch wheatgrass composition from 13% to 3%. Prairie junegrass increased dramatically in the first year (2% to 9%) but declined to 4% in the fifth year. Sandberg's bluegrass also declined as a result of the light burn.

Litter increased to near pre-burn coverage by the fifth year after the fire. Bare ground, 21% before the burn, increased to 27% and then declined to only 3% in year five. Mosses increased dramatically to 27% after plunging to a cover of only 1% the year after the burn.

Other findings

Two of the moderately burned plots were inside the Allen Springs livestock and all-ungulate exclosures. Because the fire burned uniformly through both exclosures, and across all sampling transects, the comparison between the post-burn vegetation of both exclosures was enlightening. For brevity the all-ungulate exclosure will be referred to as "game" and the livestock-proof exclosure will be referred to as "stock."

The protective nature of the game exclosure allowed post-fire succession to take place undisturbed by grazing animals. As a result the principal bunchgrasses (Idaho fescue, prairie junegrass, and bluebunch wheatgrass) all demonstrated continued increases in occupancy of the site in the fifth year of sampling while the trend was downward in the stock exclosure where elk could graze. Interestingly, annual bromes prevailed in the game exclosure while being eliminated in the stock exclosure. This can be attributed to the desirability of the annual grasses early in the summer and also to the fact that no grazing over many years has allowed annual grasses to get established on bare ground inside the game exclosure where rodents thrive due to high litter levels. Sandberg's bluegrass (a known increaser with disturbance in these communities) was much more prevalent in the stock exclosure before (5%) and after the burn (5%) than inside the game exclosure (1%). The trafficking (trampling) by elk and deer provides less litter (18% vs. 55%) and causes more bare ground (17% vs. 5%), which in turn

gives a competitive advantage to the bluegrass for successful establishment.

It was observed that mosses tended to occupy the shaded, moister and cooler microhabitat at the bunchgrass edge. Therefore, where mosses were entwined with the bunchgrass crowns the fire tended to burn with longer duration, burn hotter, and cause greater mortality than where bunches were isolated from the moss.

**Idaho fescue - prairie junegrass (ridgetops) plant association (FEID-KOCR) (n=4)**

| Burn Intensity | --------Moderate-------- (n=3) | | | --------Light-------- (n=1) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Grasses | | | | | | |
| Idaho fescue (FEID) | ✳25 ◆(18-29) | 13 (10-17) | 15 (12-21) | 20 | 20 | 18 |
| bluebunch wheatgrass (AGSP) | 26 (24-28) | 14 (3-20) | 14 (9-17) | 13 | 4 | 3 |
| prairie junegrass (KOCR) | 3 (0-6) | 5 (1-8) | 5 (1-9) | 2 | 9 | 4 |
| Sandberg's bluegrass (POSA3) | 2 (0-5) | 2 (0-5) | 3 (0-9) | 14 | 10 | 7 |
| annual bromes (BROMU) | 7 (3-15) | 8 (0-15) | 4 (0-8) | 1 | 4 | 6 |
| Perennial Forbs | | | | | | |
| western yarrow (ACMIL) | 4 (1-7) | 1 (1-2) | 2 (1-3) | 3 | 1 | 1 |
| arrowleaf balsamroot (BASA) | 2 (1-4) | t (0-2) | t (0-1) | 0 | 0 | 0 |
| longleaf phlox (PHLO) | 4 (0-5) | t (0-2) | 1 (0-1) | 0 | 0 | 0 |
| silky lupine (LUSE) | 6 (1-8) | 4 (1-6) | 5 (3-7) | 2 | 0 | 0 |
| Annual Forbs | | | | | | |
| pale alyssum (ALAL) | 1 (1-2) | 6 (1-14) | 1 (1-2) | 0 | 0 | 0 |
| shining chickweed (STNI) | 0 | 7 (0-20) | 1 (0-1) | 0 | 0 | 0 |
| yellow salsify (TRDU) | 3 (1-5) | 3 (1-4) | 1 (0-1) | 0 | 1 | 1 |
| narrowleaved collomia (COLI2) | t (0-1) | 1 (1-2) | 1 (1-1) | 0 | 0 | 1 |
| prickly lettuce (LASE) | 2 (1-3) | 1 (0-1) | 1 (1-2) | 0 | 0 | 0 |
| tall annual willowweed (EPPA) | 1 (0-1) | t (0-1) | 4 (2-7) | 0 | 0 | 2 |
| Litter | 52 (25-75) | 37 (26-59) | 35 (18-55) | 44 | 19 | 38 |
| Bare Ground | 15 (14-17) | 24 (14-34) | 10 (5-17) | 21 | 27 | 3 |
| Moss | 11 (2-24) | 7 (0-11) | 13 (1-28) | 19 | 1 | 27 |
| Lichen | 1 (0-1) | t (0-1) | 2 (1-4) | 0 | 0 | 1 |

✳ Area Coverage (%)
◆ Range of Cover (%)

## FEID-KOCR (Ridgetops)

Plot 194 **Established - 1963** **Burned moderately - 1986** **Joseph-Starvation Fire**
**Allen Spring Ridge (Game Exclosure), Wallowa Valley Ranger District, Wallowa-Whitman National Forest**

**August 1978 – Idaho fescue and bluebunch wheatgrass were co-dominant (27-28%). Sandberg's bluegrass was present at 7%; annual bromes averaged 15%. Prairie junegrass and Kentucky bluegrass averaged 6-7%. Mosses covered 24% of the ground surface.**

**September 1986 – The ridgetop site burned moderately. The greening shown in this mid-September view resulted from rapid sprouting by Kentucky bluegrass following light moisture availability. The game exclosure remained intact.**

## FEID-KOCR (Ridgetops)

August 1987 – Idaho fescue cover declined (28% to 12%); bluebunch wheatgrass declined (27% to 3%); prairie junegrass increased slightly (6% - 8%) while Kentucky bluegrass tripled in cover (7% to 21%). Annual bromes declined (15% to 10%). Moss coverage was reduced to half (24% to 11%). Chickweed flourished as an invader (20%).

May 1992 – Five years after the burn, Idaho fescue rebounded to 21%; bluebunch wheatgrass increased to 9%; and prairie junegrass remained constant (9%). Kentucky bluegrass declined to near pre-burn levels (9% cover in year 5). Annual bromes declined again to only 4% cover. Mosses remained constant (10%). Chickweed declined dramatically to 1% as tall annual willowweed invaded (7%). Essentially the moderate ridgetop burn was beneficial to bunchgrass maintenance.

## Idaho fescue - prairie junegrass (high elevation) plant association (FEID-KOCR)

Three plots were selected to study the fire effects in the Idaho fescue-prairie junegrass plant association. They are on steep canyon slopes at high elevations (above 4000 ft.). The three plots were established on the Teepee Butte Burn of 1988 and prior to that event. All plots were lightly burned. They are located on steep slopes (avg.= 50%) on three differing aspects (north, east, and west) at elevations ranging from 4700 ft to 5060 ft (avg. = 4930 ft). The plots were sampled the first and fifth years after the fire.

Light burn findings

Common snowberry and rose often have minor coverages on these sites (especially in cove or concave microsites). These species responded differently to the light burn. Rose increased and snowberry declined. The decrease in snowberry could be attributed to its intolerance of slightly drier, warmer conditions resulting from the burn or from preferential browsing of new growth by elk and deer.

Idaho fescue was initially affected detrimentally by the burn (cover decreased from 38% to 18%) but then jumped to an impressive post-burn high in the fifth year (53%). Bluebunch wheatgrass followed the same trend by first declining from 12% to 9% and then doubling to 18% in the fifth year. Prairie junegrass dropped to 3% in year five and Sandberg's bluegrass went out of the community as a weak performer on steep slopes.

Perennial forbs increasing with the burn were longleaf phlox, silky lupine (11% to 41%), red avens, and harsh paintbrush. Declining from the light burn were yarrow, creamy buckwheat, twin arnica, and deerhorn. Plants remaining constant throughout the pre- and post-burn periods were arrowleaf balsamroot, red besseya, and annual bromes (cheatgrass, soft chess, and rattlesnake brome).

Over the 5-year period, litter doubled to 61% resulting in a sharp decline by mosses (28% to 4%). Bare ground, though doubling from 20% to 40% the year after the fire, returned to a coverage of 20% in year five.

**Idaho fescue - prairie junegrass (high elevation) plant association (FEID-KOCR) (n=3)**

| Burn Intensity | -------Light------ (n=3) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Grasses | | | |
| Idaho fescue (FEID) | ✳**38** | **18** | **53** |
| | ◆(19-55) | (10-25) | (15-85) |
| bluebunch wheatgrass (AGSP) | **12** | **9** | **18** |
| | (7-15) | (5-13) | (15-20) |
| prairie junegrass (KOCR) | **2** | **6** | **3** |
| | (0-5) | (3-10) | (0-7) |
| Sandberg's bluegrass (POSA3) | **2** | **t** | **0** |
| | (0-5) | (0-1) | |
| annual bromes (BROMU) | **5** | **9** | **4** |
| | (1-13) | (2-12) | (0-10) |
| Perennial Forbs | | | |
| longleaf phlox (PHLO) | **1** | **1** | **6** |
| | (0-1) | (0-1) | (0-20) |
| silky lupine (LUSE) | **11** | **1** | **41** |
| | (1-15) | (0-1) | (2-70) |
| harsh paintbrush (CAHI2) | **1** | **3** | **7** |
| | (0-3) | (0-5) | (0-10) |
| western yarrow (ACMIL) | **9** | **9** | **4** |
| | (6-10) | (1-3) | (0-10) |
| creamy buckwheat (ERHE) | **5** | **3** | **2** |
| | (5-5) | (1-5) | (1-5) |
| red avens (GETR) | **2** | **5** | **8** |
| | (0-5) | (0-15) | (1-20) |
| twin arnica (ARSO) | **5** | **2** | **3** |
| | (1-10) | (1-5) | (1-5) |
| Annual Forbs | | | |
| deerhorn (CLPU) | **5** | **2** | **0** |
| | (1-10) | (0-5) | |
| Litter | **30** | **28** | **61** |
| | (15-45) | (20-45 | (48-70) |
| Bare Ground | **21** | **40** | **20** |
| | (5-53) | (25-54) | (5-45) |
| Moss | **28** | **20** | **4** |
| | (0-70) | (1-40) | (1-5) |
| Lichen | **0** | **0** | **t** |
| | | | (0-1) |

✳ Average Cover (%)
◆ Range of Cover (%)

## FEID-KOCR (High Elevation)

**Plot 6907 Established - 1957 Burned lightly - 1988 Teepee Butte Fire**
**Downey Saddle, Hells Canyon NRA, Wallowa-Whitman National Forest**

July 1976 – Idaho fescue, prairie junegrass, and bluebunch wheatgrass dominated the site. Sandberg's bluegrass was present (5%) along with creamy buckwheat (5%) and yarrow (6%). Snowberry and rose had increased because of severe grazing by elk and cattle over the 1957 - 1976 period.

**October 1988 – Fire burned much of standing biomass, but skipped ground litter and some plants.**

**July 1989 – Idaho fescue and prairie junegrass both declined from pre-burn coverages; but bluebunch wheatgrass doubled (7% to 13%). Creamy buckwheat, Sandberg's bluegrass, and yarrow all declined in coverage the first year after the fire.**

**June 1995 – Idaho fescue and prairie junegrass rebounded to near pre-burn coverages. Making a notable increase the fifth year after the fire was bluebunch wheatgrass (20% cover). The light burn was beneficial to bunchgrass vitality and dominance.**

## Idaho fescue - prairie junegrass (mounds) plant association (FEID-KOCR)

Three sites with patterned ground (mounds) were used to study fire's effects on the Idaho fescue-prairie junegrass plant association. All sites contained plots that pre-existed the fire (Thomason complex 1994). Two plots represented the plant association in mid seral stage; the third plot represented an early seral stage. The plots are all on gentle ridgetops (3% - 5%) with southwesterly aspects at 4480 ft, 4560 ft, and 4570 ft in elevation. The burn on the mid-seral communities was moderate; the burn on the early-seral community was light. The plots were resampled the first year after the burn.

### Moderate burn findings

In the first year after the burn, Idaho fescue declined (37% to 20%), bluebunch wheatgrass increased (5% to 17%), and Sandberg's bluegrass remained unaffected at a cover of 5%. This is a classic relationship for these three bunchgrasses where the more sensitive fescue decreases, opportunistic wheatgrass colonizes rapidly and the low statured bluegrass is unaffected by the moderate burn. Prairie junegrass remained constant following the burn. The only forbs to decrease on the plot were creamy buckwheat, red avens, and yarrow. Pioneering plants entering the site for the first time as a result of the fire were twin arnica, small-flowered fringecup, pink microsteris, swale desert-parsley, and small-flowered blue eyed Mary. Of these twin arnica, small-flowered fringecup and pink microsteris were especially prolific with coverages at 10%. Interestingly two "weedy" components of the pre-burn community decreased the first year after the burn -- Kentucky bluegrass and cheatgrass -- which had been present before the burn. Mosses declined as well from the moderate burn.

### Light burn findings

This very early seral stage was dominated by creamy buckwheat (40%) in the pre-burn community. The site had degenerated from heavy overgrazing to the degree that Idaho fescue and bluebunch wheatgrass had been eliminated. Two kinds of ungulate-induced changes occurred: overuse of bunchgrasses in early summer and the warming and drying of the microhabitat from canopy loss and concurrent litter loss. This allowed Kentucky bluegrass to colonize and expand. As a result, Kentucky bluegrass increased. Apparently the light burn gave the competitive advantage to the rhizomatous bluegrass over other bunchgrasses. However annual bromes (cheatgrass and soft chess) doubled. Creamy buckwheat showed a first year decline from 40% to 15%. It will likely increase aggressively by the fifth year following the burn. Other forbs showing a post-burn decline were yarrow and deerhorn. Swale desert-parsley increased dramatically (1% to 20%) and dominated the mound the first year after the burn. Annual forbs entering the site as a result of this light burn were pink microsteris and small-flowered blue eyed Mary. Seed from plants on adjacent sites initiated germinants of bluebunch wheatgrass and prairie junegrass. Perhaps by the fifth-year sampling of this site those species will be working their way back into the community composition.

**Idaho fescue - prairie junegrass (mounds) plant association (FEID-KOCR) (n=3)**

| Burn Intensity | ----Moderate---- (n=2) | | -----Light----- (n=1) | |
|---|---|---|---|---|
| **Species** | **PRE** | **1** | **PRE** | **1** |
| Grasses | | | | |
| Idaho fescue (FEID) | ✳37 ◆(35-38) | 20 (19-20) | 0 | 0 |
| bluebunch wheatgrass (AGSP) | 5 (5-6) | 17 (8-25) | 0 | 1 |
| Sandberg's bluegrass (POSA3) | 5 (1-10) | 5 (1-10) | 1 | 0 |
| prairie junegrass (KOCR) | 6 (1-10) | 7 (5-8) | 0 | 1 |
| Kentucky bluegrass (POPR) | 12 (10-13) | 1 (0-2) | 15 | 20 |
| annual bromes (BROMU) | 12 (3-20) | 4 (0-8) | 5 | 10 |
| Perennial Forbs | | | | |
| creamy buckwheat (ERHE) | 18 (0-35) | 1 (0-3) | 40 | 15 |
| red avens (GETR) | 20 (0-40) | 15 (0-30) | 0 | 0 |
| yarrow (ACMIL) | 6 (3-8) | 2 (1-4) | 15 | 3 |
| twin arnica (ARSO) | 0 | 5 (0-10) | 0 | 0 |
| small-flowered fringecup (LIPA) | 0 | 5 (0-10) | 0 | 0 |
| swale desert-parsley (LOAM) | 0 | 1 (0-1) | 1 | 20 |
| Annual Forbs | | | | |
| pink microsteris (MIGR) | 0 | 8 (6-10) | 0 | 5 |
| small-flowered blue eyed Mary (COPA) | 0 | 1 (0-1) | 0 | 15 |
| deerhorn (CLPU) | 1 (0-1) | 0 | 40 | 1 |
| Litter | 22 (5-39) | 15 (10-19) | 1 | 5 |
| Bare Ground | 25 (19-30) | 38 (25-51) | 15 | 10 |
| Moss | 9 (3-15) | 2 (0-3) | 0 | 0 |
| Lichen | 0 | 1 (0-1) | 0 | 0 |

✳ Average Cover (%)
◆ Range of Cover (%)

## FEID-KOCR (Mounds)

Plot 139 Established - 1978 Burned moderately - 1986 Joseph-Starvation Fire
Horse Pasture Ridge, Wallowa Valley RD, Wallowa-Whitman National Forest

1978 – Bunchgrasses dominated on mounds in a mid-seral Idaho fescue - prairie junegrass community. Bluebunch wheatgrass dominated (25%) with Idaho fescue (17%) and prairie junegrass (3%) subordinate. Annual bromes averaged 35%.

1986 – This site burned moderately with all standing culms and leaves consumed.

1987 – The year after the burn, annual bromes and yarrow made a showy, aggressive increase in the bunchgrass community.

## FEID-KOCR (Mounds)

Plot 191 Established - 1978 Burned moderately - 1994 Thomason Fire
Vance Knoll, Wallowa Valley RD, Wallowa-Whitman National Forest

August 1978 – Idaho fescue dominated over bluebunch wheatgrass (35% to 5%) in the pre-burn community. Red avens and creamy buckwheat were high in coverage on the mound top. Prairie junegrass provided 10% cover.

September 1994 – Fire burned moderately across the mound top, sides, and intervening swale. Some interstitial areas were missed by the fire.

June 1995 – Idaho fescue declined to 20% but bluebunch wheatgrass increased markedly to 25% becoming the dominant bunchgrass. Red avens, creamy buckwheat, and prairie junegrass all declined. Invading were twin arnica (10%) and fringecup (10%). Stature of plants was lower the first growing season after the fire influencing some low coverage percentages.

## Idaho fescue - prairie junegrass (low elevation) plant association (FEID-KOCR)

Four plots were used to study fire's effects on the low-elevation (less than 4000 ft) vegetation of the Idaho fescue - prairie junegrass plant association. One plot burned severely in the Middle Point Fire of 1986. The other three plots burned moderately in the Teepee Butte Fire of 1988. All plots pre-existed the fires. In the hot, dry lower canyon these communities can only occur where aspect affords microenvironments capable of sustaining enough moisture and cooler temperatures through the summer months. Therefore these sites are all on north to northeast aspects on steep slopes (58% to 75%) with an average of 66%. The elevations ranged from 2830 ft to 2980 ft (avg.=2902 ft). The plots were resampled the first and fifth years after the burns.

Severe burn findings

Idaho fescue and bluebunch wheatgrass are the dominant bunchgrasses in later seral stages in this plant association. Idaho fescue was the most affected by this severe burn declining from 35% to 16% coverage. It rebounded to 30% cover in the fifth year following the burn. Bluebunch wheatgrass, however, was constant at 15%. Prairie junegrass increased the first year after the burn but then declined to only 1% cover by the fifth year. Other plants present in the pre-burn community that declined from the burn event were twin arnica and western hawkweed. Missouri goldenrod and field chickweed both declined dramatically in the first year and were absent by the fifth year. Plants entering the site following the burn were yarrow, Kentucky bluegrass, and Sandberg's bluegrass. The one species present before the fire that increased after the fire and five years later was white stemmed frasera. By the fifth year litter had increased from first year cover (32% to 37%); bare ground had decreased from 23% to only 3%; and cryptogams were returning to the community (9%) from a total loss after the fire.

Moderate burn findings

Idaho fescue and bluebunch wheatgrass both declined to half their pre-burn cover the year after the burn but then rebounded in the fifth year to higher coverages than their pre-burn levels. Prairie junegrass declined after the fire and was absent by the fifth year. Sandberg's bluegrass increased dramatically from 1% to 5% after the moderate burn but then was absent in year five. Annual bromes (cheatgrass, rattlesnake brome, and Japanese brome) maintained a constant cover throughout the pre- and post-burn periods. Other plants were scant in these communities. The only annual forb to capitalize on the burn event was common speedwell.

Litter declined the first year after the fire but then dramatically increased to 78% in year five. The initial increase in bare ground on the site (18% to 34%) declined to just 13% by the fifth year. Mosses and lichens, which were a large component of the pre-burn community (29%), declined to 12% after the fire and continued to decline with the increase in litter to only 7% in year five.

In the severely burned site, mosses were often entwined with bunchgrass bases. This allowed some fescue plants to burn longer (smoldering) and for the heat to penetrate deeper into the crowns. The result was mortality of those plants. Of all Idaho fescue sites sampled in this study following fires, the greatest mortality of fescue plants occurred in the communities of this plant association where grass density was highest and associated herbaceous cover was also high. Two plants pioneering the first year after these intense burns, but absent by the fifth year, were mountain tansy mustard and tumblemustard.

**Idaho fescue - prairie junegrass (low elevation) plant association (FEID-KOCR) (n=4)**

| Burn Intensity | --------Severe-------- (n=1) | | | --------Moderate------- (n=3) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Grasses | | | | | | |
| Idaho fescue (FEID) | ✳35 | 16 | 30 | 16 ◆(15-17) | 9 (7-11) | 27 (12-37) |
| bluebunch wheatgrass (AGSP) | 15 | 14 | 15 | 21 (19-22) | 11 (8-14) | 23 (16-31) |
| prairie junegrass (KOCR) | 5 | 8 | 1 | 2 (0-3) | 1 (0-2) | 0 |
| Kentucky bluegrass (POPR) | 0 | 0 | 1 | 0 | 0 | 0 |
| Sandberg's bluegrass (POSA3) | 0 | 0 | 1 | 1 (0-1) | 5 (1-8) | 0 |
| annual bromes (BROMU) | 0 | 0 | 0 | 2 (1-3) | 2 (1-4) | 1 (1-2) |
| Perennial Forbs | | | | | | |
| twin arnica (ARSO) | 20 | 0 | 1 | t (0-1) | t (0-1) | 0 |
| western hawkweed (HIAL2) | 5 | 3 | 2 | 0 | 0 | 0 |
| Missouri goldenrod (SOMI) | 20 | 1 | 0 | 0 | 0 | 0 |
| western yarrow (ACMIL) | 0 | 2 | 1 | 3 (1-5) | 2 (1-2) | 1 (0-1) |
| white stemmed frasera (FRAL2) | 1 | 3 | 5 | 0 | 0 | 0 |
| Annual Forbs | | | | | | |
| field chickweed (CEAR) | 10 | 2 | 0 | 0 | 0 | 0 |
| common speedwell (VEAR) | 0 | 0 | 0 | 1 (0-1) | 1 (0-2) | 3 (0-6) |
| Litter | 25 | 32 | 37 | 48 (41-54) | 33 (30-39) | 78 (68-88) |
| Bare Ground | 0 | 23 | 3 | 18 (6-32) | 34 (22-40) | 13 (4-18) |
| Moss | 40 | 0 | 6 | 22 (7-41) | 6 (1-11) | 5 (2-7) |
| Lichen | 0 | 0 | 3 | 7 (0-16) | 6 (3-8) | 2 (1-3) |

✳ Average Cover (%)
◆ Range of Cover (%)

## FEID-KOCR (Low Elevation)

Plot 1108 Established - 1984 Burned severely - 1986 Sheep Divide Fire

Middle Point Ridge, Hells Canyon NRA, Wallowa-Whitman National Forest

May 1984 – Idaho fescue clearly dominated (35%) over bluebunch wheatgrass (15%) and prairie junegrass (5%). Forbs present in high coverage were twin arnica (20%), goldenrod (20%), and chickweed (10%). Use by deer, elk, and cattle influenced the plant composition.

September 1986 – The site was burned severely with some terracettes being "undermined" by burning of litter and duff.

**June 1987 – Idaho fescue declined; prairie junegrass increased to 8%; and bluebunch wheatgrass remained constant. Twin arnica, goldenrod, and chickweed all declined dramatically the first growing season after the fire from pre-burn levels. Bare ground constituted about 25% of the plot area.**

**May 1992 – Idaho fescue had rebounded to pre-burn cover (30%); bluebunch wheatgrass remained at 15%; prairie junegrass declined to only 1%. Twin arnica was present at 1%. Chickweed and goldenrod had left the community. Bare ground was now at only 3% cover. Mosses and lichens recovered to 9%.**

## Idaho fescue - bluebunch wheatgrass - silky lupine plant association (FEID-AGSP-LUSE)

One plot used to study fire's effects in this plant association existed prior to the Joseph-Starvation Fire of 1986. It was resampled the first and fifth years after the burn. The plot is on a northeast-facing slope (55%) at an elevation of 4300 ft. The site burned moderately.

### Moderate burn findings

The two primary bunchgrasses declined with the fire event. Idaho fescue declined more rapidly; bluebunch wheatgrass also declined but less dramatically and tended to hold its occupancy better. Idaho fescue cover changed from 10% in the pre-burn community to 8% the year after the burn and to only 2% in the fifth year. Bluebunch wheatgrass declined from 28% to 24% to 12% over the sampling periods. Annual bromes increased dramatically (cheatgrass, rattlesnake brome, soft chess, and rattlesnake brome) to 31% in the fifth year. Sandberg's bluegrass and yarrow were constant over the period. Entering the sites as pioneers were tall annual willowweed, pale alyssum, and deerhorn. Perennial forbs declining over the period were silky lupine and arrowleaf balsamroot. Creamy buckwheat declined the year after the burn but was increasing by year five.

Litter first declined and then increased; bare ground declined from pre-burn to post-burn; and cryptogam cover increased by the fifth year after the burn.

**Idaho fescue - bluebunch wheatgrass - silky lupine plant association (FEID-AGSP-LUSE) (n=1)**

| Burn Intensity | --------Moderate-------- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Grasses | | | |
| Idaho fescue (FEID) | *10 | 8 | 2 |
| bluebunch wheatgrass (AGSP) | 28 | 24 | 12 |
| Sandberg's bluegrass (POSA3) | 2 | 3 | 1 |
| annual bromes (BROMU) | 3 | 4 | 31 |
| Perennial Forbs | | | |
| western yarrow (ACMIL) | 4 | 3 | 6 |
| creamy buckwheat (ERHE) | 5 | 2 | 7 |
| silky lupine (LUSE) | 11 | 2 | 2 |
| arrowleaf balsamroot (BASA) | 3 | 2 | 1 |
| Annual Forbs | | | |
| tall annual willowweed (EPPA) | 0 | 0 | 1 |
| pale alyssum (ALAL) | 0 | 0 | 1 |
| deerhorn (CLPU) | 0 | 0 | 1 |
| Litter | 28 | 23 | 32 |
| Bare Ground | 29 | 25 | 3 |
| Moss | 1 | 1 | 2 |
| Lichen | 1 | 0 | 3 |

* Average Cover (%)

**FEID-AGSP-LUSE**

**Plot 678** **Established - 1981** **Burned moderately** **Teepee Butte Fire**
**Cold Spring Ridge, Hells Canyon NRA, Wallowa-Whitman National Forest**

**1981 – The mid-seral community was dominated by bluebunch wheatgrass with Idaho fescue associated. Forbs present were arrowleaf balsamroot, silky lupine, deerhorn, and yarrow.**

**1988 – The fire burned moderately leaving some grass tufts uncharred. The area between vegetation patches and bunchgrass tufts was unburned.**

**1989 – The first year after the burn, bluebunch wheatgrass and Idaho fescue are vigorous and approaching pre-burn abundance. Balsamroot retained the same cover and was not affected by the burn. Prominent forbs are yarrow, death camas, and harsh paintbrush. The overall composition is about the same as before the burn. Bunchgrass vigor and vitality improved from the burn.**

FEID-AGSP-LUSE

Plot 123 Established - 1979 Burned moderately - 1986 Joseph-Starvation Fire

Horse Pasture Ridge, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

July 1979 – Bluebunch wheatgrass dominated (28%) with Idaho fescue and Sandberg's bluegrass associated at 10% and 2% respectively. Silky lupine cover was 11% before the fire. Creamy buckwheat (5%), yarrow (4%), and arrowleaf balsamroot (3%) were principal forbs in the community. Annual bromes accounted for only 3% cover.

September 1986 – All standing biomass was consumed; litter and ground cover was basically unburned.

June 1987 – Bluebunch wheatgrass remained the dominant plant at near pre-burn levels (24%). Idaho fescue and Sandberg's bluegrass remained constant. Silky lupine declined dramatically to 2%. Creamy buckwheat dropped to 2%; yarrow decreased to 3%; and arrowleaf balsamroot declined to 2%. Annual bromes were constant at 4%. Bare ground covered 25% of the area.

June 1992 – Five years after the fire, bluebunch wheatgrass had declined to only 12% cover; Idaho fescue dropped to 2% and Sandberg's bluegrass was only present at 1%. Silky lupine and balsamroot were constant at low coverage levels. Increasing on the site were creamy buckwheat (7%), yarrow (6%), and annual bromes (31%). The decline in bunchgrasses and increase in bromes was probably a result of ungulate grazing pressure (elk, cattle) rather than a natural successional phenomenon.

## Idaho fescue - bluebunch wheatgrass - arrowleaf balsamroot plant association (FEID-AGSP-BASA)

Four plots were used to study the fire effects to vegetation in this plant association. Two plots pre-dated the Joseph-Starvation Burn of 1986; one fire pre-dated the Teepee Butte Burn of 1988; and one plot was established after the Gould Gulch Burn of 1986. All plots were resampled the first and fifth years after the fires. One plot burned severely; 2 plots burned moderately; and one plot burned lightly. All plots are on either southeasterly or southwesterly aspects and occur on steep slopes (30% to 40%) with an average of 36%. Elevations range from 4000 to 5100 ft (avg.= 4475 ft).

### Severe burn findings

Vegetation of this plant association is typified by a union of plants typically found on drier, warmer sites than where Idaho fescue - bluebunch wheatgrass - silky lupine communities can persist. Arrowleaf balsamroot may or may not, be part of the "union." In the case of this severely burned plot on Joseph-Starvation burn, arrowleaf balsamroot was not part of the pre- or post-burn communities. The three principal bunchgrasses of this type all showed declines from the severe burn. Idaho fescue declined slightly; bluebunch wheatgrass declined from 35% to 17%; and Sandberg's bluegrass declined from 10% to 5%. Increasing as a result of the burn on this southerly slope were annual bromes (cheatgrass, Japanese brome, and rattlesnake brome); tall annual willowweed; blepharipappus; and lomatiums (swale desert-parsley, nine-leaf lomatium). Annuals constituted those plants entering the community as a result of the burn. Among the annual forbs capitalizing on the severe burn were pale allysum, deerhorn, prickly lettuce, pink microsteris, and skullcap.

Litter declined in the first year after the burn and increased in the fifth year to 26%. Bare ground conversely increased in the first year after the burn (20% to 48%) but then declined to 11%. Mosses and lichens entered the post-burn community in the fifth year at 8% cover.

### Moderate burn findings

The two principal bunchgrasses (Idaho fescue and bluebunch wheatgrass) declined slightly as a result of the moderate burn. Sandberg's bluegrass was constant at 5% over the period. Arrowleaf balsamroot declined in cover from 9% to 1% the fifth year after the burn. Plants increasing as a result of the burn were yarrow, tall annual willow herb, and blepharipappus. Plants entering the community as a result of the burn were pale alyssum, pink microsteris, and yellow salsify. Annual bromes were explosive on the Fire Ridge plot with a fifth year entry at 8% cover. Four different bromes were involved (cheatgrass, soft chess, rattlesnake brome, and Japanese brome). By the fifth year after the burns, bare ground had declined and cryptogams had increased to 16% cover.

### Light burn findings

Bluebunch wheatgrass responded in the fifth year by rebounding to nearly its pre-burn coverage of 24%. Idaho fescue doubled from a pre-burn coverage of 6% to a fifth year coverage of 12%. Arrowleaf balsamroot coverage drastically declined from a pre-burn cover of 10% to only 1% in the fifth year. Sandberg's bluegrass declined from 6% to 3% the first year after the burn and then was absent by year five. Plants maintaining a consistent cover throughout the pre- to post-burn periods were yarrow and lupine. Annual bromes were relatively constant at low coverage after five years. Plants entering the community as a result of this light burn were pale alyssum, deerhorn, tall annual willowweed, and pink microsteris. Over the 5 year period, litter increased; bare ground declined; and cryptogams maintained a constancy at 2%.

### Summary

Fire intensities affected the bunchgrasses differently. Bluebunch wheatgrass was most affected by the severe burn and least affected by the light burn. Idaho fescue, on the other hand, was constant with only slight declines from the severe and moderate burns but doubled with the light fire. Sandberg's bluegrass cover was erratic in response to the burns. It declined with the severe burn, remained constant with the moderate burn, but was eliminated by the light burn! Predictably the annual bromes invaded or increased

dramatically along with a host of annual forbs in the severely burned site and were least effective as colonizers in the light burn. Litter increases were greatest in the light burn. Mosses and lichens tended to colonize best following the severe burn.

Wildlife use was attributed to the fifth year decline by bluebunch wheatgrass and Idaho fescue from first year levels in the severely burned plot.

**Idaho fescue - bluebunch wheatgrass - arrowleaf balsamroot (FEID-AGSP-BASA) (n=4)**

| Burn Intensity | -------Severe------- (n=1) | | | --------Moderate------ * (n=2) | | | -------Light------- (n=1) | | |
|---|---|---|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Grasses | | | | | | | | | |
| Idaho fescue (FEID) | ✳5 | 6 | 3 | 4 | 3 ◆(1-5) | 2 (1-3) | 6 | 6 | 12 |
| bluebunch wheatgrass (AGSP) | 35 | 30 | 17 | 16 | 11 (10-12) | 8 (8-9) | 24 | 7 | 22 |
| Sandberg's bluegrass (POSA3) | 10 | 6 | 5 | 5 | 8 (8-9) | 5 (5-6) | 6 | 3 | 0 |
| annual bromes (BROMU) | 3 | 3 | 9 | 0 | 0 | 4 (0-8) | 5 | 6 | 3 |
| Perennial Forbs | | | | | | | | | |
| lomatiums (LOAM, LOTR) | 1 | 1 | 2 | 1 | 0 | 1 (1-2) | 3 | 1 | 1 |
| narrow-leaved skullcap (SCAN) | 0 | 1 | 1 | 1 | 0 | 1 (0-1) | 2 | 3 | 1 |
| arrowleaf balsamroot (BASA) | 0 | 0 | 0 | 9 | 5 (4-6) | 1 (0-2) | 10 | 1 | 1 |
| western yarrow (ACMIL) | 1 | 1 | 1 | 1 | 0 | 2 (2-2) | 3 | 1 | 4 |
| silky lupine (LUSE) | 0 | 0 | 0 | 1 | 0 | 1 (0-1) | 2 | 1 | 2 |
| Annual Forbs | | | | | | | | | |
| tall annual willowweed (EPPA) | 1 | 1 | 8 | 1 | 0 | 9 (1-18) | 0 | 2 | 3 |
| blepharipappus (BLSC) | 1 | 1 | 3 | 1 | 0 | 3 (0-5) | 0 | 0 | 0 |
| pale allysum (ALAL) | 0 | 1 | 1 | 0 | 0 | 1 (0-1) | 0 | 1 | 1 |
| deerhorn (CLPU) | 0 | 0 | 1 | 1 | 0 | 1 (0-1) | 0 | 2 | 0 |
| prickly lettuce (LASE) | 0 | 1 | 4 | 1 | 0 | 1 (0-1) | 1 | 0 | 1 |
| pink microsteris (MIGR) | 0 | 0 | 1 | 0 | 0 | 1 (1-1) | 0 | 1 | 2 |
| yellow salsify (TRDU) | 1 | 0 | 1 | 0 | 0 | 1 (0-1) | 1 | 1 | 1 |
| Litter | 20 | 11 | 26 | 36 | No | 32 | 15 | 7 | 44 |
| Bare Ground | 20 | 48 | 11 | 31 | Data | 14 | 44 | 53 | 35 |
| Moss | 0 | 0 | 4 | 5 | | 10 | 1 | 1 | 1 |
| Lichen | 0 | 0 | 4 | 0 | | 6 | 0 | 0 | 1 |

* - Average for pre-burn derived from 1 plot
✳ Average Cover (%)
◆ Range of Cover (%)

FEID-AGSP-BASA

Plot 633 Established - 1981 Burned moderately - 1986 Joseph-Starvation Fire

Davis Creek Canyon, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

**July 1981 – Bluebunch wheatgrass dominated (16%) with Sandberg's bluegrass and Idaho fescue subordinate at 5%. Arrowleaf balsamroot was prominent at 9%.**

**October 1986 – Fall moisture provided rapid "greening" by the sprouting vegetation following the moderate burn. Most standing biomass had been consumed by the fire.**

June 1987 – Bluebunch wheatgrass dominated after the fire (12%). Idaho fescue remained constant at 5% but Sandberg's bluegrass doubled its cover to 9%. Arrowleaf balsamroot declined to 6%.

June 1992 – By the fifth year following the fire, the dominant plant was tall annual willowweed (18%). Bluebunch wheatgrass was still the dominant bunchgrass (8%) but it had declined as had Idaho fescue (3%) and Sandberg's bluegrass (6%). Arrowleaf balsamroot also had diminished. The increase in annuals (blepharipappus and willowweed) coupled with a decline in bunchgrasses can probably be attributed to the combined use by cattle and elk.

## Idaho fescue - bluebunch wheatgrass - Snake River phlox plant association (FEID-AGSP-PHCO2)

One plot located on Middle Point overlooking the Imnaha River was used to study fire's effects on vegetation pertaining to this plant association. The site was moderately burned by the Middle Point Fire of 1986. It is located on a steep (65%) northeast exposure at 2890 ft in elevation. The plot pre-dated the fire and was resampled the first and fifth years following the burn.

### Moderate burn findings

The fire caused a decline in cover by bluebunch wheatgrass from a pre-burn cover of 20% to a fifth-year cover of 10%. Idaho fescue maintained its pre-burn cover of 10% with little effect by the burn. Entering the community after the burn at low coverages were prairie junegrass, Sandberg's bluegrass, and cheatgrass. Snake River phlox, the indicator forb of the association, remained constant throughout the pre- and post-burn periods. Other forbs remaining constant from this light burn were yarrow, tapertip hawksbeard, and penstemon. Forbs that entered following the burn were blepharipappus, prickly lettuce, and skullcap. Litter increased dramatically from a pre-burn cover of 5% to a fifth-year cover of 22%. Bare ground cover was 9% the first year after the fire but returned to a pre-burn level of 1% by the fifth year. Occupying much of the ground surface in the pre-burn community were mosses and lichens (70%). The fire was detrimental to the cryptogams. By the fifth year mosses and lichens accounted for a cover of 35%.

### Summary

This plot represented a late seral stage of development for the community prior to the burn. The burn was moderate owing to the spatial separation of the bunchgrasses common to the dry, lithic sites of this type. However, fire burned hot about the bases of the bluebunch wheatgrass plants where mosses were collected about the crowns. This allowed fire to kill more wheatgrasses in relation to the fescue as a result. In addition, the location of bunchgrasses on the exterior side of *terracettes concentrated the fire on those portions resulting in intense burning of the duff. The result was a "shelving" left by the concave burning of the underside of the terracette.

Additionally, the loss of the bunchgrass foliar cover allowed the site to further heat and desiccate, which was detrimental to the maintenance of the moss mat. As a combined result of killing by fire's heat and climatic heat, moss cover declined precipitously from 60% to only 7%. Lichens, on the other hand, occupied the interspaces between the bunchgrasses and were unaffected by the burn with a resulting three-fold increase on the site in year five (10% to 28%).

* Terracettes are step-like formations on steep bunchgrass slopes created by surface soil creep. They may be accentuated in their development by large animals.

**Idaho fescue - bluebunch wheatgrass - Snake River phlox plant association (FEID-AGSP-PHCO2) (n=1)**

| Burn Intensity | --------Light-------- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Grasses | | | |
| bluebunch wheatgrass (AGSP) | *20 | 9 | 10 |
| Idaho fescue (FEID) | 10 | 10 | 9 |
| prairie junegrass (KOCR) | 0 | 1 | 1 |
| Sandberg's bluegrass (POSA3) | 0 | 1 | 1 |
| cheatgrass (BRTE) | 0 | 1 | 3 |
| Perennial Forbs | | | |
| Snake River phlox (PHCO2) | 1 | 0 | 1 |
| western yarrow (ACMIL) | 3 | 1 | 2 |
| tapertip hawksbeard (CRAC) | 1 | 1 | 1 |
| penstemon (PENST) | 1 | 1 | 1 |
| narrowleaved skullcap (SCAN) | 0 | 1 | 1 |
| Annual Forbs | | | |
| blepharipappus (BLSC) | 0 | 0 | 1 |
| prickly lettuce (LASE) | 0 | 0 | 1 |
| Litter | 5 | 1 | 22 |
| Bare Ground | 1 | 9 | 1 |
| Moss | 60 | >57< | 7 |
| Lichen | 10 | >57< | 28 |

* Average Cover (%)

FEID-AGSP-PHCO2

Plot 1107 Established - 1984 Burned moderately - 1986 Sheep Divide Fire

Middle Point Ridge, Hells Canyon NRA, Wallowa-Whitman National Forest

May 1984 – Bluebunch wheatgrass was dominant over Idaho fescue (20% to 10%). Mosses and lichens were very prominent at 70%!

September 1986 – The site was moderately burned. Bunchgrass bases were uncharred. Note the "shelves" created by the fire where mosses and bunchgrasses (particularly bluebunch wheatgrass) provided fuels for intense burning into the duff.

June 1987 – Idaho fescue remained constant at 10% and became the dominant bunchgrass on the site when bluebunch wheatgrass declined to 9%. Note the shelving with sharp edges at the ground surface and darkened concavities where the duff was consumed.

May 1992 – Idaho fescue and bluebunch were co-dominant at 10% cover the fifth year after the fire. Bare ground dramatically declined as litter cover increased to 22%. Mosses and lichens were sharply reduced from pre-burn levels (70% to 35%).

## Western juniper/mountain-mahogany/bluebunch wheatgrass plant association (JUOC/CELE/AGSP)

Two plots were installed on a severely burned site and a moderately burned site following the Eagle Fire of 1986. One plot was established on an east-facing 10% slope at 4550 ft elevation. The other plot was placed on a south-facing 60% slope at 4540 ft elevation. The plots were sampled the first and fifth years after the burn.

### Severe burn findings

The juniper and mahogany were killed by crown fire.

Mountain snowberry resprouted and increased from 2% to 10% over the five year period. Gray and green rabbitbrushes had entered the site as pioneers on intensely burned areas by the fifth year.

Pinegrass increased on the fringes of the plot from adjacent ponderosa pine-Douglas-fir forest. Bluebunch wheatgrass was slow to respond and was not found in first-year samples. By the fifth year the wheatgrass was present at 11% cover. Also occupying the site for the first time in year five were annual bromes (cheatgrass and soft chess). Other herbaceous pioneers on the site were yarrow, prickly lettuce, bull thistle, Douglas' knotweed, Idaho fescue, western fescue, and yellow salsify.

Over the five-year period litter increased (7% to 78%) and bare ground decreased (90% to 15%). Moss was present at only 1% cover.

### Moderate burn findings

The fire killed juniper and mountain-mahogany on the plot. The first-year sampling found no juniper seedlings, but mountain-mahogany responded the first year with germinants which were still present in the fifth year. Juniper was germinating on the site in the 5th year as well.

Also rapidly responding to the bare mineral soil exposed by the fire were green rabbitbrush and mountain snowberry.

Bluebunch wheatgrass was present the first year after the fire and increased to 8% cover by the fifth year. Annual bromes (cheatgrass and soft chess) were also quick to respond (2% cover in year one; 24% cover by year five). Other pioneers present on the plot were yarrow, prickly lettuce, houndstongue, bull thistle, Douglas' knotweed, western fescue, and salsify.

Over the five-year period litter increased (34% to 73%) and bare ground decreased (64% to 16%). Moss was present at only 1% cover.

### Other findings

Intermediate wheatgrass was seeded on these two sites. Both sites showed increases in coverage of this exotic (8% and 11%) by the fifth year.

### Summary

Both juniper and mountain-mahogany are vulnerable to mortality from moderate and severe burning. Observations made in Blue Mountain burns show that a light burn often promotes germination of mountain-mahogany. Perhaps with normal fire periodicity the concern for vitality of this species may be reduced. A comparison between the severe and moderate burns showed 36% of the species in year five were present in year one on the severe burned area, while 61% of the year 5 species were present in year one following the moderate burn. Thus the shock of the higher intensity burn was greater to the site.

**Western juniper/mountain-mahogany/bluebunch wheatgrass plant association (JUOC/CELE/AGSP) (n=2)**

| Burn Intensity | -----Severe----- (n=1) | | -----Moderate---- (n=1) | |
|---|---|---|---|---|
| **Species** | **1** | **5** | **1** | **5** |
| Trees | | | | |
| western juniper (JUOC) | ✳**0** | **0** | 0 | 1 |
| Shrubs | | | | |
| mountain-mahogany (CELE) | **0** | **0** | 1 | 1 |
| mountain snowberry (SYOR) | **2** | **10** | 1 | 1 |
| rabbitbrush (CHNA, CHVI) | **0** | **2** | 1 | 3 |
| Grasses | | | | |
| pinegrass (CARU) | **1** | **4** | 1 | 1 |
| bluebunch wheatgrass (AGSP) | **0** | **11** | 1 | 8 |
| annual bromes (BROMU) | **0** | **24** | 2 | 24 |
| Idaho fescue (FEID) | **0** | **1** | 0 | 0 |
| western fescue (FESC) | **0** | **1** | 1 | 1 |
| Perennial Forbs | | | | |
| western yarrow (ACMIL) | **1** | **1** | 1 | 1 |
| Annual Forbs | | | | |
| prickly lettuce (LASE) | **0** | **1** | 0 | 1 |
| yellow salsify (TRDU) | **0** | **1** | 0 | 1 |
| houndstongue (CYOF) | **0** | **0** | 0 | 1 |
| Douglas' knotweed (PODO) | **1** | **1** | 0 | 1 |
| Litter | **7** | **78** | 34 | 73 |
| Bare Ground | **90** | **15** | 64 | 16 |
| Moss | **0** | **1** | 0 | 1 |
| Lichen | **0** | **0** | 0 | 0 |

✳ Average Cover (%)

## Ninebark-common snowberry plant association (PHMA-SYAL)

The Joseph-Starvation Fire of 1986 burned many stringers of Douglas-fir/ninebark and ninebark-common snowberry communities. One of the pre-existing plots burned severely and was chosen for this fire effects study. The plot is located with a northwest aspect on a 67% slope at 4530 ft elevation. It was resampled in the first and fifth years following the fire.

Severe burn findings

These stringers have evolved with fire-resilient vegetation. Ninebark, spiraea, and snowberry responded by sprouting from blackened root crowns the year after the burn. However, as ninebark cover increased, snowberry and spiraea declined slightly. After five years the shrubland was again dominated by ninebark; almost back to its pre-burn coverage by the species. Serviceberry, present at 10% in the pre-burn community, didn't fare as well. It was only occupying 1% of the area in year five.

A key pre-burn component at 40% cover, pinegrass steadily increased from the first year through the fifth year from rhizomes and seeded germinants. By the fifth year it had rebounded to 23% cover. Pioneers entering the burned area the first year after the fire were miner's lettuce, threadleaf phacelia, cheatgrass, rattlesnake brome, and tumblemustard. All had declined on the plot by the fifth year except for miner's lettuce. Plants entering the site in the fifth year of post-fire succession were tall annual willowweed, prickly lettuce, heartleaf arnica, yarrow, and prairie junegrass. Plants present in all years (pre-burn and post-burn) were bluebunch wheatgrass, cleavers, Idaho fescue, and varileaf phacelia.

Litter increased from 25% the first year to 47% the fifth year. The year after the burn, bare ground was sampled at 25% of the area. By the fifth year it had dropped to 9%. Mosses were again present at pre-burn coverage amounts by the fifth year.

Other findings

Brittle bladder fern is very susceptible to fire. It was present in the re-burn community at 5% cover. It was killed by this fire.

Ninebark sprouted profusely a year after the burn sending up 18-24" leaders. Common snowberry, birchleaf spiraea, and pinegrass were vigorous sprouters the year after the burn. Tumblemustard was an opportunist achieving 20% cover on the site the first year after the burn. Winter wheat seeded in nearby forest sites made a 5% presence on the site the first year from aerial seeding drift. It was gone from the site by the fifth year.

**Ninebark - common snowberry plant association (PHMA-SYAL) (n=1)**

| Burn Intensity | -----Severe----- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Shrubs | | | |
| ninebark (PHMA) | *80 | 45 | 68 |
| common snowberry (SYAL) | 40 | 10 | 5 |
| birchleaf spiraea (SPBE) | 0 | 5 | 1 |
| serviceberry (AMAL) | 10 | 1 | 1 |
| Grasses | | | |
| bluebunch wheatgrass (AGSP) | 5 | 1 | 2 |
| Idaho fescue (FEID) | 5 | 1 | 1 |
| prairie junegrass (KOCR) | 0 | 0 | 1 |
| pinegrass (CARU) | 40 | 15 | 23 |
| annual bromes (BROMU) | 0 | 5 | 5 |
| Perennial Forbs | | | |
| heartleaf arnica (ARCO) | 20 | 0 | 4 |
| western yarrow (ACMIL) | 1 | 0 | 1 |
| varileaf phacelia (PHHE) | 1 | 5 | 1 |
| Annual Forbs | | | |
| prickly lettuce (LASE) | 0 | 0 | 1 |
| threadleaf phacelia (PHLI) | 0 | 3 | 1 |
| tumblemustard (SIAL) | 0 | 20 | 1 |
| tall annual willowweed (EPPA) | 0 | 0 | 1 |
| miner's lettuce (MOPE) | 0 | 1 | 5 |
| cleavers (GAAP) | 10 | 1 | 1 |
| Litter | 90 | 25 | 47 |
| Bare Ground | 0 | 25 | 9 |
| Moss | 1 | 0 | 1 |
| Lichen | 0 | 0 | 0 |

* Average Cover (%)

PHMA-SYAL

Plot 118 Established - 1978 Burned severely - 1986 Joseph-Starvation Fire

Horse Pasture Ridge, Wallowa Valley RD, Wallowa-Whitman National Forest

July 1978 – The pre-burn community was dominated by ninebark (80%), common snowberry (40%), pinegrass (20%), and heartleaf arnica (20%).

September 1986 – The site was burned severely with all standing biomass consumed. The density of shrub, grass, and forb vegetation provided abundant light- and moderate-sized fuels.

August 1987– Ninebark cover was reduced by 50% and snowberry by 75%. The shrubs resprouted from shrub bases and rhizomes the first year after the fire. Pinegrass responded (15%) as did annual bromes (5%). Heartleaf arnica was absent. Tumblemustard was the dominant herbaceous plant (20%).

June 1992 – Ninebark cover increased to 68% (almost to pre-burn level). Snowberry declined to 5%. Pinegrass increased to 23%. Heartleaf arnica returned (4%). Tumblemustard, prominent the first year after the burn, had declined by the fifth year to 1%. Annual bromes remained constant at 5%.

## Common snowberry - rose plant association (SYAL-ROSA)

The Pleasant Valley Exclosures were constructed in 1971. They encompass snowberry - rose communities that were burned moderately by a human-caused fire in 1985. Transects had been established prior to the completion of the exclosures. They were first sampled in 1969. They were resampled in 1983 prior to the 1985 fire. Then following the fire the transects were sampled the first year after the burn (1986); and again 10 years later in 1996.

The ungulate-proof (GAME) exclosure is located on a 15% east-facing slope at 2530 ft elevation. The comparative livestock-proof (STOCK) exclosure is located on a 20% east-facing slope at 2620 ft elevation. The community in the GAME exclosure had succeeded in the absence of disturbance (fire, grazing, and browsing animals) to a late seral stage of development where snowberry and rose dominated. The STOCK exclosure, with continued grazing pressure from wild ungulates and lack of fire, had achieved an early-mid seral stage of development where mid-seral grasses dominated and shrubs were still repressed.

Moderate burn findings

Late seral vegetation burned in the GAME exclosure.

Snowberry and rose combined for a coverage of 75% prior to the burn. The first year after the burn they covered just 20% of the area. Annual herbs now dominated. The occupancy was by thymeleaf sandwort, yellow salsify, annual bromes (cheatgrass, rattlesnake brome, hairy chess), cleavers, prickly lettuce, and American vetch. The sandwort cover was 38%, annual bromes accounted for 10%, and salsify cover was at 12%. Plants entering the site in the first year following the fire were yarrow (10% cover), salsify (12% cover), Kentucky bluegrass, moth mullein, and bluebunch wheatgrass.

By the tenth year following the burn, snowberry and rose had increased to a combined coverage of 44%. Other increases in cover were by arrowleaf balsamroot, silky lupine, cleavers, and prickly lettuce. Some plants present in the pre-burn community (not found in the first-year samples) returned and were prominent by the tenth year. These included goatweed and miner's lettuce. Plants leaving the community from the post-burn community by the tenth year were yellow hawkweed, salsify, moth mullein, Kentucky bluegrass, and American vetch. Declining by the tenth year were yarrow and thymeleaf sandwort (38% in year one to a trace in year ten). A few plants entering the community since the first year that were prominent in year 10 were chervil and white plectritis.

Litter cover returned to pre-burn levels. Bare ground had never been high in cover, was absent by year 10, and was now covered by mosses!

Moderate burn findings

Early-mid seral vegetation burned in the STOCK exclosure.

Snowberry had been repressed from this community by browsing ungulates prior to the burn. Rose plants were sparse in the pre-burn grass-dominated community. The aggressive Kentucky bluegrass mats kept the other plants in remission. Bluegrass dominated the stock exclosure (43% cover) with silky lupine providing the only other cover in double digits (11%).

Following the burn, the first year response showed a meager increase by rose, and a dominance by annuals: thyme leaf sandwort (65%), annual bromes (9%), yellow salsify, and field chickweed. Perennial herbs that were prominent were silky lupine (increased from 11% to 20%), false gromwell (increased from 3% to 9%), and yarrow (increased from 5% to 13%). Kentucky bluegrass was the dominant perennial at 35% cover.

Ten years later shrubs were still repressed. Rose was back to 1% cover; snowberry was essentially absent. Kentucky bluegrass was still the dominant herb at 32% cover. Increasing from pre-burn community levels were bluebunch wheatgrass (2% to 18%), annual bromes (3% to 12%), and goatweed (1% to 3%). Plants no longer in the community by the tenth year were thyme leaf sandwort, prickly lettuce, and field chickweed (all annuals that pioneered the site immediately after the burn). Declining by the

tenth year from previous sampling were yarrow, false gromwell, silky lupine, and yellow salsify.

By year 10 litter had regained its high coverage of the ground surface (98%), bareground was only 1%, and moss cover was only a trace.

Other findings

In the GAME exclosure (late seral community), rose was the initial beneficiary of the burn in its competition with snowberry. Two plants that increased their occupancy of this community from pre-burn to tenth year were miner's lettuce and cleavers. Together they increased from 4% to 20% coverage from the pre-burn community.

Sheep historically had grazed the benchlands of Pleasant Valley until 1971. Their use of the site was heavy and sustained each grazing season. Following the construction of the exclosures in 1971, cattle grazed for only two seasons (1975-76). Today the allotment is vacant of livestock use. However, increasing elk populations have added a new dimension to the grazing within the STOCK exclosure. Now, the benches of the Snake River canyon are available year-round to a wild ungulate that is basically an herbaceous grazer. With the removal of livestock and the increase in elk there has been a resultant increase in use of these communities repetitively year-after-year during the late winter and early spring. This use occurs when these sites are most vulnerable from a plant development point of view and when soils are easily exposed from trampling. As a result there has been a dramatic invasion by a native annual bedstraw that has occupied the interspaces between bunchgrasses and other perennial plants to such density as to preclude any germination by other plants. This perennial plant is "small bedstraw" (*Galium trifidum*). It was not found in any prior sampling at this site. In the tenth-year sampling of the STOCK exclosure, small bedstraw was found with a coverage of 27% ! This species, which entwines the other plants, may be more inhibiting to their vitality than the stoloniferous mats of Kentucky bluegrass. It also provides a deep, dense litter between bunchgrass plants, which could increase future burn severities.

**Common snowberry - rose plant association (SYAL-ROSA) (n=2)**

| Burn Intensity | Game Exclosure Moderate (n=1) | | | Stock Exclosure Moderate (n=1) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Shrubs | | | | | | |
| common snowberry (SYAL) | ***65** | **4** | **31** | 0 | 0 | 0 |
| rose (ROSA) | **10** | **16** | **13** | 1 | 2 | 1 |
| Grasses | | | | | | |
| bluebunch wheatgrass (AGSP) | **0** | **5** | **6** | 2 | 3 | 18 |
| Kentucky bluegrass (POPR) | **0** | **7** | **0** | 43 | 35 | 32 |
| annual bromes (BROMU) | **2** | **10** | **11** | 3 | 9 | 12 |
| Perennial Forbs | | | | | | |
| western yarrow (ACMIL) | **0** | **10** | **3** | 5 | 13 | 1 |
| moth mullein (VEBL) | **0** | **3** | **0** | 0 | 0 | 0 |
| arrowleaf balsamroot (BASA) | **3** | **1** | **7** | 1 | 1 | 0 |
| silky lupine (LUSE) | **3** | **5** | **12** | 11 | 20 | 5 |
| goatweed (HYPE) | **10** | **0** | **9** | 1 | 0 | 3 |
| false gromwell (LIRU) | **1** | **1** | **0** | 3 | 9 | 1 |
| American vetch (VIAM) | **1** | **8** | **0** | 0 | 0 | 6 |
| Annual Forbs | | | | | | |
| yellow salsify (TRDU) | **0** | **12** | **0** | 0 | 2 | 1 |
| cleavers (GAAP) | **3** | **3** | **12** | 0 | 0 | t |
| prickly lettuce (LASE) | **1** | **1** | **4** | 1 | t | 0 |
| thymeleaf sandwort (ARSE) | **1** | **38** | **t** | 1 | 65 | 0 |
| miner's lettuce (MOPE) | **1** | **0** | **8** | 0 | 0 | 0 |
| chervil (ANSC2) | **0** | **0** | **10** | 0 | 0 | 0 |
| white plectritis (PLMA3) | **0** | **0** | **5** | 0 | 0 | 0 |
| field chickweed (CEAR) | **0** | **0** | **0** | 3 | 3 | 0 |
| Litter | **93** | **0** | **95** | 86 | No | 98 |
| Bare Ground | **4** | **2** | **0** | 0 | Data | 1 |
| Moss | **0** | **0** | **3** | 9 | | t |
| Lichen | **0** | **0** | **0** | 0 | | 0 |

* Average Cover (%)

## SYAL-ROSA

Plot 747 Established - 1982 Burned moderately - 1985

Pleasant Valley Exclosure (GAME), Hells Canyon NRA, Wallowa-Whitman National Forest

June 1983 – Shrubs (common snowberry, rose) totally dominated the community (75% cover). Goatweed was a prominent forb (10%), but cleavers was the most common herb (32%).

August 1985 - The moderate burn left standing stems of snowberry and rose in an otherwise "clean" burn of the site.

June 1986 – Where snowberry had dominated over rose (65% to 10%) in the pre-burn community, the dominance was reversed the first year after the fire. Rose increased over snowberry (16% to 4%). Annual vegetation was dominant over perennials led by thymeleaf sandwort (38%), yellow salsify (12%), and annual bromes (10%). Other prominent forbs were yarrow (10%), silky lupine (5%), and American vetch (8%). Goatweed was absent.

June 1996 – Ten years after the fires, common snowberry again dominated over rose (31% to 13%). Annuals were still a large component. Thymeleaf sandwort declined dramatically to 1%; yellow salsify dropped out, cleavers increased to 12%, and chervil cover increased to 10%. Annual bromes remained constant at 11%. Silky lupine increased to 12%; arrowleaf balsamroot was prominent at 7%, and goatweed had returned to pre-burn levels (9%).

## Mountain big sagebrush/Idaho fescue plant association (ARTRV/FEID)

Three plots established prior to the Dooley Mountain burn of 1989 and the Jordan Springs burn of 1994 were used to study the fire effects on vegetation of the mountain big sagebrush/Idaho fescue plant association. The Dooley Mountain plots were re-sampled in years one and five following the burn. The Jordan Springs plot was re-sampled the first year after it burned. The plots are located on south and westerly slopes averaging 27% (20 to 30%) at elevations averaging 5977 ft ( 5830 to 6100 ft). Two sites burned severely and one burned moderately.

Severe burn findings

Mountain big sagebrush is slow to respond to severe burns. It sprouts from the bases of plants when root crowns are not killed. But many plants were killed by the fire. In the absence of repeated fires every 10-15 years it will reoccupy the site. Coverage by sagebrush averaged 45% in pre-burn communities and only 1% in post-burn communities. Another shrub was affected in just the opposite way. Green rabbitbrush increased from 2% in pre-burn communities to 5% in post-burn communities.

Key herbaceous plants in the pre-burn community were Idaho fescue, bluebunch wheatgrass, creamy buckwheat, and lupines (tailcup and spurred lupines). Idaho fescue declined from 33% to 3% following the burn. Bluebunch wheatgrass was constant at 5% cover. Buckwheat declined from 24% to 3% following the intense burn. Increasers with the fire were yarrow, Sandberg's bluegrass, and tumblemustard.

Plants entering the sites as a result of the severe burn were tall annual willowweed, prickly lettuce, wayside gromwell, western needlegrass, yellow salsify, and arrowleaf balsamroot.

Litter was consumed by the fire decreasing from 27% to 4% in year one and then rebounding to 49% in the fifth year. Bare ground increased from the fire (8% to 37%) in year one, then declined to 23% as litter increased. Moss and lichen cover was scant before and after the burns.

Moderate burn findings

Mountain big sagebrush was reduced by the burn with some individuals succumbing while others resprouted from root crowns the following year. By the fifth year mountain big sage had made a 30% recovery toward pre-burn levels of abundance. Green rabbitbrush was not a part of the pre-burn community and was only a minor component of the post-burn community.

The same key herbaceous plants were part of the pre-burn community as in those of the severely burned plots. Idaho fescue, bluebunch wheatgrass, creamy buckwheat, and yarrow all declined as a result of the fire but by the fifth year had rebounded. Of interest was the change in creamy buckwheat cover. It was an opportunist gaining from 9% cover in the pre-burn community to 15% in the fifth year following the burn. Tailcup lupine and prairie junegrass increased with the fire event. Interestingly Sandberg's bluegrass declined from 7% to 1%. Plants entering the site as a result of this moderate burn were narrowleaf pussytoes, narrow-leaved collomia, tall annual willowweed, thread-leaved fleabane, western hawkweed, western needlegrass, and dandelion.

Litter cover declined from 39% to 19% the first year after the burn; then increased to 55% in the fifth year. Bare ground conversely increased from 6% to 21% the first year after the burn; then declined to 17% in the fifth year. Mosses and lichens increased with this moderate burn from 1% to 4%.

Other findings

Unfortunately sagebrush density was not counted prior to any of the burns. On the Jordan Springs burn a count was made the year after the burn at 14 individual sprouts. This is a density of 151 shrubs per acre.

Deer and elk use of post-burn communities in sagebrush/grassland communities is high. Heavy cropping was witnessed on prickly lettuce, large flowered collomia, and tapertip hawksbeard.

Summary

The severe burn provided the opportunity for a greater increase in rabbitbrush than occurred in the moderately burned plot. Sandberg's bluegrass made a greater gain after the severe burn than in the moderate burn. Idaho fescue was more affected by the severe burn than by the moderate burn. In both burns the species diversity was enhanced. The number of species doubled in both burns from pre-burn to first year after the fire.

**Mountain big sagebrush/Idaho fescue plant association (ARTRV/FEID) (n=3)**

| Burn Intensity | -----Severe----- (n=2) | | -----Moderate---- (n=1) | | |
|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **PRE** | **1** | **5** |
| Shrubs | | | | | |
| mountain big sagebrush (ARTRV) | *45 (65-25) | 1 (0-1) | 9 | 1 | 3 |
| green rabbitbrush (CHVI) | 2 (1-3) | 5 (0-10) | 0 | 0 | 1 |
| Grasses | | | | | |
| Idaho fescue (FEID) | 33 (26-40) | 3 (1-5) | 30 | 7 | 15 |
| bluebunch wheatgrass (AGSP) | 5 (3-7) | 5 (5-5) | 13 | 5 | 10 |
| Sandberg's bluegrass (POSA3) | 4 (3-5) | 6 (1-10) | 7 | 4 | 1 |
| mountain brome (BRCA) | 3 (1-6) | 3 (0-5) | 0 | 5 | 4 |
| prairie junegrass (KOCR) | 0 | 0 | 1 | 4 | 4 |
| western needlegrass (STOC) | 0 | 2 (0-3) | 0 | 1 | 1 |
| Perennial Forbs | | | | | |
| creamy buckwheat (ERHE) | 24 (18-30) | 3 (1-5) | 9 | 5 | 15 |
| lupines (LUCA, LULA2) | 12 (9-15) | 8 (6-10) | 3 | 10 | 6 |
| yarrow (ACMIL) | 2 (1-3) | 4 (3-5) | 7 | 1 | 3 |
| wayside gromwell (LIRU) | 0 | 1 (1-1) | 0 | 0 | 0 |
| arrowleaf balsamroot (BASA) | 0 | 1 (0-1) | 0 | 0 | 0 |
| narrowleaf pussytoes (ANST) | 0 | 1 (0-1) | 0 | 2 | 6 |
| western hawkweed (HIAL2) | 0 | 1 (0-1) | 0 | 3 | 6 |
| threadleaved fleabane (ERFI) | 0 | 1 (0-1) | 0 | 2 | 4 |
| Annual Forbs | | | | | |
| tumblemustard (SIAL) | 1 (1-1) | 2 (1-3) | 1 | 0 | 0 |
| tall annual willowweed (EPPA) | 0 | 1 (0-1) | 0 | 1 | 1 |
| prickly lettuce (LASE) | 0 | 1 (1-1) | 0 | 0 | 0 |
| yellow salsify (TRDU) | 0 | 0 | 0 | 1 | 0 |
| narrow-leaved collomia (COLI2) | 0 | 1 (0-2) | 0 | 2 | 5 |
| Litter | 27 (15-38) | 4 (1-8) | 39 | 19 | 55 |
| Bare Ground | 8 (6-10) | 37 (20-55) | 6 | 21 | 17 |
| Moss | 0 | 1 (0-1) | 1 | 2 | 3 |
| Lichen | 1 (0-1) | 0 | 0 | 0 | 1 |

* Average Cover (%)

## ARTRV/FEID

Plot 8057 Established - June 1994 Burned severely - August 1994 Jordan Springs Fire
Ralph's Spring, Burns Ranger District, Malheur National Forest

June 1994 – Mountain big sagebrush dominated the site (65%). Gray rabbitbrush was a component at 3%. The most common herbaceous plants were grasses (Idaho fescue dominated at 40%; Sandberg's bluegrass 5%; bluebunch wheatgrass 3%). Creamy buckwheat was prominent at 30% cover.

September 1994 – The fire burned severely owing to the density and volatility of the sagebrush. Woody stems were burned to ground level. Some fescue bunches were killed.

July 1995 – The first year after the fire, sagebrush resprouted with leaders to 6-inch heights. Sagebrush post-burn density approximated 140 sprouts per acre. Gray rabbitbrush tripled to 10%. Grass coverage was less than in the pre-burn community (Idaho fescue and bluebunch wheatgrass = 5%). Sandberg's bluegrass doubled to 10%. Creamy buckwheat declined to 5%.

## ARTRV/FEID

**Ralph's Spring Plot Location.**

**June 1994 – Prior to the Jordan Springs Fire.**

**September 1994 – After the August burn.**

**July 1995 – First growing season after the fire.**

## Smooth sumac/bluebunch wheatgrass plant association (RHGL/AGSP)

One plot was used to study effects of fire in the smooth sumac/bluebunch wheatgrass plant association. The plot was established prior to the Joseph-Starvation burn on 1986 in Joseph Canyon. The fire burned moderately across the southeast facing slope. The plot is located at 2750 ft elevation on a 65% slope. It was sampled the first and fifth years following the burn.

### Moderate burn findings

The sumac was unaffected by the fire and maintained its 15% cover from pre-burn through post-burn sampling periods. Creeping Oregon-grape and rose were the only other shrubs present in the community; and they maintained their presence. Rose increased slightly after 5 years.

Bluebunch wheatgrass was the most dominant herbaceous plant. It decreased slightly the first year after the burn but increased by the fifth year. Cheatgrass and rattlesnake brome increased as a result of the burn. Tall annual willowweed entered the site in the fifth year. Arrowleaf balsamroot and yellow salsify both entered the community following the burn. Unaffected by the burn were yarrow and lupines.

Litter increased, bare ground declined, and mosses and lichens increased to 3% cover over the 5 years following the fire.

### Other findings

Smooth sumac responded vigorously to this moderate burn sending up shoots 12 to 18 inches tall the first growing season after the burn. By the fifth year the sumac shrubs were from 2 to 4 feet tall. It is this kind of burn event that appears to stimulate the included vegetation without appreciable modification of the plant composition. There were no significant declines nor increases in the cover by this moderate burn in this plant association.

**Smooth sumac/bluebunch wheatgrass plant association (RHGL/AGSP) (n=1)**

| Burn Intensity | -----Moderate----- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Shrubs | | | |
| smooth sumac (RHGL) | *14 | 15 | 15 |
| creeping Oregon-grape (BERE) | 1 | 1 | 1 |
| rose (ROSA) | 1 | 1 | 3 |
| Grasses | | | |
| bluebunch wheatgrass (AGSP) | 15 | 14 | 21 |
| annual bromes (BROMU) | 4 | 0 | 7 |
| Perennial Forbs | | | |
| yarrow (ACMIL) | 1 | 1 | 2 |
| lupines (LUPIN) | 1 | 1 | 1 |
| arrowleaf balsamroot (BASA) | 0 | 1 | 1 |
| Annual Forbs | | | |
| tall annual willowweed (EPPA) | 0 | 0 | 4 |
| yellow salsify (TRDU) | 0 | 1 | 1 |
| Litter | 32 | No | 44 |
| Bare Ground | 15 | Data | 4 |
| Moss | 0 | | 1 |
| Lichen | 0 | | 2 |

* Average Cover (%)

RHGL/AGSP

Plot 622 Established - 1981 Burned moderately - 1986 Joseph-Starvation Fire

Joseph Creek Canyon, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

June 1981 – Bluebunch wheatgrass and smooth sumac co-dominated the pre-burn community. Annual bromes were present at 4%.

October 1986 – The moderate burn consumed all standing herbaceous vegetation but left the stems of sumac charred and standing. Sumac leaves were partially consumed.

July 1992 – Five years after the fire sumac remained constant at 15%. Bluebunch wheatgrass increased to 21% to be the dominant plant on the site - eclipsing pre-burn coverages. Annual bromes also increased to 7% coverage.

## Ponderosa pine/common snowberry plant association (PIPO/SYAL)

Three plots were installed after the Gould Gulch and Fire Ridge Fires of 1986. Two sites were lightly underburned and one site had received a stand-replacement burn (severe). All plots were established after the fires and sampled in years one and five following the fires.

Elevations of these plots ranged from 3920 ft to 4120 ft (avg. = 4013 ft). Plots are located on northeast and westerly aspects and on slopes ranging from 10% to 50% (avg. = 32%).

### Severe burn findings

The majority of the pines (6-10 inches in diameter in a pole-size stand) were killed by crown fire.

The dominant shrubs after 5 years were common snowberry (7% cover) and birchleaf spiraea.

The severe burn on the warm, dry site resulted in a slow response by herbaceous perennials. Dominating in the fifth year were cheatgrass (35%), tall annual willowweed (5%), and moss (48%). Late seral stage plants were scant (pinegrass; prairie junegrass; Idaho fescue). Lupine remained constant at low coverages in both sampling periods. Litter had increased and bare ground had declined between the first and fifth years after the burn. The moss cover of year five essentially covered the bare ground residual from year one after the burn. This attests to the severity of the fire and the inability of perennial plants to occupy the new surface.

### Light burn findings

The majority of the trees survived the underburn. By the fifth year seedlings of ponderosa pine covered the ground in patches where the litter and duff were consumed resulting in suitable conditions for pine germination.

Common snowberry had increased over the five years from the light burn event. The only other shrubs present were birchleaf spiraea and creeping Oregon-grape.

Pinegrass increased from 6% to 11% from the first to fifth year after the burns. Plants entering the sites in the fifth year were prairie junegrass, western fescue, prickly lettuce, and tall annual willowweed. Annual bromes (cheatgrass, soft chess, and rattlesnake brome) increased over the 5-year period following the burns. Lupine increased slightly from the first to fifth years.

Litter increased; bare ground decreased; and moss cover averaged 6% five years after the burn.

### Summary

This is a dry, warm microenvironment. When disturbances remove perennial plant cover the resulting bare ground heats and becomes desiccated. Thus perennial plants are slow to recolonize.

Common snowberry resprouts readily after light burns. Pinegrass readily flowers and disseminates seed to capitalize on the bareground prepared by the burn. Annual bromes flourished (35% cover) on the severe burn but were much less aggressive on the light burn. Mosses increased dramatically on the severely burned ground surface (48%) compared to the lightly burned surface (6%) owing to the consumption of the litter layer by the fire.

Prickly lettuce was heavily browsed the first year after the burn and was attributed to elk grazing. Snowberry plants also had been browsed.

**Ponderosa pine/common snowberry plant association (PIPO/SYAL) (n=3)**

| Burn Intensity | ----Severe---- (n=1) | | -----Light---- (n=2) | |
|---|---|---|---|---|
| **Species** | 1 | 5 | 1 | 5 |
| Trees | | | | |
| ponderosa pine (PIPO) | 0 | 0 | 0 | ✳1<br>◆(1-1) |
| Shrubs | | | | |
| common snowberry (SYAL) | 1 | 7 | 1<br>(1-2) | 5<br>(5-6) |
| birchleaf spiraea (SPBE) | 0 | 1 | 1<br>(0-1) | 1<br>(0-1) |
| creeping Oregon-grape (BERE) | 0 | 0 | 1<br>(1-1) | 1<br>(0-1) |
| Grasses | | | | |
| pinegrass (CARU) | 0 | 1 | 6<br>(1-11) | 11<br>(1-20) |
| Idaho fescue (FEID) | 0 | 1 | 1<br>(0-2) | 2<br>(0-4) |
| western fescue (FEOC) | 0 | 0 | 0 | 1<br>(0-1) |
| annual bromes (BROMU) | 0 | 35 | 1<br>(1-1) | 6<br>(2-10) |
| prairie junegrass (KOCR) | 2 | 2 | 0 | 2<br>(1-3) |
| Perennial Forbs | | | | |
| lupine (LUPIN) | 1 | 1 | 1<br>(0-2) | 2<br>(1-3) |
| Annual Forbs | | | | |
| tall annual willowweed (EPPA) | 0 | 5 | 0 | 2<br>(1-2) |
| prickly lettuce (LASE) | 0 | 1 | 0 | 1<br>(1-1) |
| Litter | 34 | 69 | 46<br>(46-46) | 79<br>(64-94) |
| Bare Ground | 54 | 5 | 29<br>(29-29) | 5<br>(2-7) |
| Moss | 1 | 48 | 0 | 6<br>(6-7) |
| Lichen | 0 | 1 | 0 | 1<br>(0-2) |

✳ Average Cover (%)
◆ Range of Cover (%)

PIPO/SYAL

Plot 2403 Established - October 1986 Burned lightly - August 1986 Gould Gulch Burn
Fire Ridge, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

August 1986 – A light underburn consumed the standing herbaceous vegetation. Woody stems of shrubs remained standing.

June 1987 – Pinegrass responded rapidly by sprouting and flowering. It dominated with a cover of 11%. Common snowberry resprouted and had a cover of 2%.

July 1992 – Five years after the fire, pinegrass increased its domination by doubling to a cover of 20%. Common snowberry also increased to 6%. Ponderosa pine seedlings were prevalent in high numbers. Lupine was the only forb of note with 3% cover.

## Ponderosa pine/pinegrass plant association (PIPO/CARU)

Three plots were used to sample after 1986 burns (Fire Ridge, Blue Canyon, and Scalp). Two plots were established on severely burned sites; one plot was established on a light underburn. The Fire Ridge and Blue Canyon plots were sampled in years one and five following the fires. The Scalp plot was sampled in years one and eight. Elevations ranged from 3790 ft to 5040 ft (avg. = 4560 ft). Plots were oriented on southerly and easterly slopes (5% to 35%) with an average of 20%. Plots were sampled the first and fifth years after the burns.

### Severe burn findings

All trees were killed by the severe burns. For this plant association, regular fire periodicity would have resulted in light-intensity underburns.

Snowbrush ceanothus was the only shrub of record on these grass-dominated plots. It increased slightly from year one to year five.

The severity of the burn on these warm, dry sites resulted in slow recolonization by pinegrass. After 5 years it only averaged 3% on these harshly burned plots. Dominating after five years were cheatgrass, hairy chess, and tall annual willowweed. Other herbaceous plants occupying the sites after five years were yarrow, prickly lettuce, and lupine.

Attesting to the severity of the burn and the inability of perennials to colonize was the relatively high percentage of bare ground remaining by the fifth year (29% avg.). Litter had increased from an average of 12% to 41% by year five. The sites were too desiccated to carry mosses to any appreciable amount.

### Light burn findings

The underburn resulted in patchy mortality of trees on the site.

No shrubs were found on the plot the first year after the burn. By year five only a trace of common snowberry was found.

Pinegrass clearly dominated in the first and fifth years achieving a cover of 25%. Idaho fescue declined to 1% by year five as the aggressive pinegrass capitalized on the underburn with its flowering and seeding. Yarrow increased slightly and prickly lettuce maintained its occupancy on the site throughout the 5 years. Plants entering the plot by the fifth year were tall annual willowweed, western hawkweed, and lupine.

Litter increased; bare ground decreased dramatically; and mosses tripled over the five years.

### Other findings

Orchardgrass seeded on one of the severely burned areas had increased from 1% the year after the burn to 10% by year five. This exotic grass outstripped any other plant on the site for dominance. Only the annual fireweed (*Epilobium paniculatum*) was close in coverage to the orchardgrass at 7%.

On the Scalp Burn plot, ponderosa pine and Douglas-fir were planted the year after the burn. Eight years later only the pines remained. The site with its south aspect and dry, warm microenvironment could not sustain Douglas-fir. The pines were 6 ft tall and vigorous at 248 trees per acre.

### Summary

The severe burn provided bare mineral soil (40% cover) for colonization by snowbrush ceanothus, annual bromes, yarrow, and tall annual willowweed. The light burn did not offer the sites required for aggressive occupation by these plants. The only big increase on the light burn was by pinegrass. It more than doubled as a result of the "maintenance" burn.

**Ponderosa pine/pinegrass plant association (PIPO/CARU) (n=3)**

| Burn Intensity | ----Severe---- (n=2) | | ----Light--- (n=1) | |
|---|---|---|---|---|
| **Species** | **1** | **5** | **1** | **5** |
| Trees | | | | |
| ponderosa pine (PIPO) | **0** | **0** | **0** | **0** |
| Shrubs | | | | |
| common snowberry (SYAL) | **0** | **0** | **0** | ✳**1** |
| snowbrush ceanothus (CEVE) | **1** ◆(0-3) | **2** (1-3) | **0** | **0** |
| Grasses | | | | |
| pinegrass (CARU) | **2** (0-5) | **3** (1-5) | **12** | **25** |
| annual bromes (BROMU) | **0** | **9** (2-16) | **1** | **1** |
| Idaho fescue (FEID) | **0** | **0** | **4** | **1** |
| prairie junegrass (KOCR) | **0** | **0** | **0** | **1** |
| Perennial Forbs | | | | |
| western yarrow (ACMIL) | **0** | **4** (3-5) | **2** | **3** |
| lupine (LUPIN) | **0** | **1** (1-1) | **0** | **4** |
| hawkweeds (HIERA) | **0** | **0** | **0** | **1** |
| Annual Forbs | | | | |
| tall annual willowweed (EPPA) | **0** | **8** (7-10) | **0** | **1** |
| prickly lettuce (LASE) | **1** (0-1) | **1** (0-2) | **1** | **1** |
| Litter | **12** (5-29) | **41** (30-52) | **75** | **93** |
| Bare Ground | **40** (40-40) | **29** (17-40) | **18** | **1** |
| Moss | **0** | **1** (0-1) | **4** | **13** |

✳ Average Cover (%)
◆ Range of Cover (%)

PIPO/CARU

Plot 5703 Established - October 1986 Burned lightly - August 1986 Fire Ridge Burn
Fire Ridge, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

October 1986 – Fire burned lightly with virtually no tree mortality.

June 1992 – Five years after the burn, pinegrass clearly dominated (cover = 25%). Other principal herbaceous components were lupine, hawkweed, and yarrow.

## Douglas-fir/ninebark plant association (PSME/PHMA)

Six plots located on Douglas-fir/ninebark sites were used to study fire's effects on the vegetation. All plots had been established prior to the fires and were resampled in the first and fifth years after the burns. The plots are located on the Joseph-Starvation and Kuhn Ridge Burns of 1986 and the Teepee Butte Burn of 1988. Four plots were severely burned; two plots were moderately burned. Elevations ranged from 2490 ft to 4950 ft (avg. = 4126 ft). The plots were all on northerly aspects with slopes ranging from 35% to 90% (avg. = 64%).

### Severely burned findings

All trees of the overstory and understory were killed by the fire. Ponderosa pine and Douglas-fir composed the pre-burn tree stands. The majority of the pines were dominants and codominants (5%) while the Douglas-fir cover averaged 8% (dominant and co-dominant trees) and 19% (intermediate and suppressed trees). Douglas-fir trees averaged 3% cover in pole-sized trees and 3% in seedlings and saplings.

Shrubs were dominated by ninebark in the pre-burn community (avg. = 51%). The ninebark canopies were consumed by the fire down to charred stubs. The shrub was quick to resprout in the first year following the burns and by the fifth year coverage was approaching pre-burn levels. Common shrub associates, spiraea and common snowberry, were each present at 24% cover in the pre-burn stands, had decreased to only 3% after the fire, and by the fifth year had rebounded to 8%. A shrub not present in the pre-burn communities that entered all sites sampled the first year after the burn as a pioneer was redstem ceanothus. It increased to 12% cover five years after the burns!

Pinegrass generally flourished in these communities following the removal of the tree and shrub canopies by the stand-replacing burns. On the other hand, elk sedge declined significantly from the severe burns (12% in pre-burn community; only a trace in fifth-year community). Heartleaf arnica entered the sites after the burn on 3 of 4 plots and increased over the 5-year period. Bigleaf sandwort was present in the pre-burn community and increased following the burns. Plants that pioneered as new to the community after the fires were yarrow, annual bromes (cheatgrass, soft chess and rattlesnake brome), Columbia brome, fireweeds, prickly lettuce, and varileaf phacelia.

Litter made a decline in the first year but rebounded beyond pre-burn levels in the fifth year. Bare ground increased from the burn but fell below pre-burn levels by the fifth year. Mosses averaged 29% in pre-burn stands but diminished to 10% in fifth year sampling. This may have been in part due to increased movement by ungulates through more open forests resulting from the burn.

### Moderate burn findings

One of the two plots burned moderately was an early seral stage community that reburned. No trees had been tallied from the pre-burn data on that plot. The other plot contained ponderosa pine (dominants) and Douglas-fir trees (dominants and intermediates) in the overstory prior to the fire. The trees succumbed to the moderate burn.

Ninebark dominated both stands prior to the burns (avg.= 28%). The ninebark responded rapidly after the burns with 7% cover in the first year and 20% cover by year five. Snowberry and spiraea remained constant from pre-burn to fifth year.

Pinegrass averaged 36% prior to the burns and increased by the fifth year to 45% cover. Elk sedge was not a component of either plot. Heartleaf arnica increased from an average of 7% to 15% after the fifth year. Other herbaceous plants present in the pre-burn community that increased following the burns were woods strawberry, cleavers, mitella, and miner's lettuce. Plants pioneering the post-burn site were bigleaf sandwort, cheatgrass, fireweeds, and prickly lettuce.

Litter remained relatively constant through the sampling period while bare ground increased after the fire returning to near pre-burn levels by year five. Mosses declined (18% to 8%). This is no doubt a result of open stand conditions allowing for greater movement by ungulates across the canyon bunchgrass slopes and through the ninebark stringers.

Other findings

The bare ground increase noted from pre-burn levels was documented as a result of elk and deer trailing, which increased owing to the opening of these sites with easier passage to stringer streams and bunchgrass grazing adjacent to the forested stands. One plot evidenced a 20% increase in bare ground attributed to the wild ungulates.

Some of these areas were seeded to exotics. The retention of exotics is a concern to some managers. Winter wheat was present on one site at 50% cover the first year after seeding. By the fifth year it was absent from the community. On the other hand, orchardgrass was tenacious. On one site it increased from 1% to 10% over the 5 years; on another it declined from 46% in the first growing season after seeding to 19% in the fifth year. Annual ryegrass was also used but was absent by the fifth year of sampling.

A plant that was not present in any early, mid, or late seres of Douglas-fir/ninebark communities but prominently emerged as a pioneer in very early seral stages was verbana (*Verbena bracteata*). It was found at coverages up to 15% the first year after the burns but was gone by year five.

A plant that is common in Douglas-fir/ninebark late seral communities is brittle bladder fern (Johnson and Simon 1987). It was present in over half of the 23 plots used to classify the late seral stage of the type at a coverage of 5%. It was uniformly killed by the burns involved with the fire study plots.

Summary

In the severe burn, elk sedge was diminished as a result of the mortality to rhizomes. However the pinegrass resiliency was rapid and dramatic. Its propensity to survive using both resprouting and seeding strategies attests to its tenacious hold in Douglas-fir plant associations. Interestingly large increases also occurred in the severe burn by heartleaf arnica as it rapidly colonized new ground where shrubs had previously dominated.

**Douglas-fir/ninebark plant association (PSME/PHMA) (n=6)**

| Burn Intensity | ------Severe------ (n=4) | | | ------Moderate------ (n=2) | | |
|---|---|---|---|---|---|---|
| **Species** | ***PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Trees | | | | | | |
| Douglas-fir (PSME) | ✳**28** ◆(6-45) | **0** | **0** | **22** (0-45) | **0** | **0** |
| ponderosa pine (PIPO) | **8** (0-25) | **0** | **0** | **10** (0-20) | **0** | **0** |
| Shrubs | | | | | | |
| ninebark (PHMA) | **51** (22-80) | **12** (0-25) | **42** (6-60) | **28** (21-35) | **7** (4-10) | **20** (15-25) |
| birchleaf spiraea (SPBE) | **24** (3-9) | **3** (0-15) | **8** (1-35) | **2** (0-4) | 2 (0-4) | 2 (0-5) |
| common snowberry (SYAL) | **24** (0-50) | **3** (1-7) | **8** (0-20) | **3** (1-5) | **1** (1-1) | **3** (0-6) |
| redstem ceanothus (CESA) | **0** | **2** (1-5) | **12** (0-35) | **0** | **0** | **0** |
| Grasses/Sedges | | | | | | |
| pinegrass (CARU) | **10** (0-20) | **5** (0-20) | **22** (2-50) | **36** (11-60) | **19** (3-35) | **45** (9-80) |
| elk sedge (CAGE) | **12** (1-20) | **1** (0-1) | **t** (0-1) | **0** | **0** | **0** |
| annual bromes (BROMU) | **0** | **1** (0-2) | **t** (0-1) | **0** | **0** | **1** (1-1) |
| Columbia brome (BRVU) | **0** | **4** (0-15) | **t** (0-1) | **0** | **0** | **0** |
| Perennial Forbs | | | | | | |
| heartleaf arnica (ARCO) | **5** (0-20) | **2** (0-3) | **21** (3-55) | **7** (3-10) | **3** (0-5) | 15 (5-25) |
| western yarrow (ACMIL) | **0** | **t** (0-1) | **2** (1-3) | 3 (0-5) | **3** (1-5) | 3 (1-5) |
| varileaf phacelia (PHHE) | **0** | **2** (1-5) | **1** (0-1) | 0 | **0** | **0** |
| woods strawberry (FRVE) | **6** (0-20) | **0** | **0** | 1 (0-2) | **7** (0-15) | **20** (0-40) |
| mitella (MIST2) | **4** (1-6) | **t** (0-1) | **7** (0-10) | **3** (2-3) | **3** (0-5) | **15** (0-30) |
| Annual Forbs | | | | | | |
| bigleaf sandwort (ARMA3) | **2** (1-3) | **5** (1-10) | **1** (0-3) | **0** | **1** (1-1) | **1** (0-1) |
| prickly lettuce (LASE) | **0** | **6** (3-10) | **t** (0-1) | **0** | **1** (1-1) | **1** (0-1) |
| cleavers (GAAP) | **1** (0-1) | **0** | **2** (0-5) | **1** (0-1) | 1 (0-1) | 8 (1-15) |
| miner's lettuce (MOPE) | **1** (0-5) | **1** (0-4) | **0** | **1** (0-1) | **1** (0-1) | 2 (1-3) |
| fireweeds (EPILO) | **0** | **1** (0-2) | **6** (3-10) | **0** | **2** (0-3) | **2** (1-3) |
| Litter | **60** (40-95) | **40** (1-82) | **78** (75-80) | **62** (49-75) | **64** (47-80) | **57** (44-70) |
| Bare Ground | **18** (0-50) | **24** (7-45) | **8** (5-10) | **7** (5-8) | **23** (15-30) | 10 (10-10) |
| Moss | **29** (3-55) | **15** (0-40) | **10** (5-20) | **18** (10-25) | **4** (0-9) | **8** (0-17) |

* - 1 plot was established after the burn.
✳ Average Cover (%)
◆ Range of Cover (%)

## PSME/PHMA

**Plot 176** Established - 1978 Burned severely - 1988 Teepee Butte Burn
Bear Ridge, Hells Canyon NRA, Wallowa-Whitman National Forest

August 1978 – Douglas-fir trees dominated the overstory with 40% canopy closure. No trees occurred in the forest understory. The shrub layer was dominated by ninebark (22%) and birchleaf spiraea (9%). The herbaceous composition contained pinegrass (4%), elk sedge (5%), and mitella (6%).

September 1988 – A stand-replacing fire killed all the trees and consumed all vegetation on the site. Small logs and other down woody materials were consumed.

September 1989 – The first year after the fire, ninebark and spiraea responded quickly and vigorously providing a cover of 20% and 15% respectively. Seed of red osier dogwood germinated and covered 5% of the site. Herbaceous plants of note were prickly lettuce (10%), varileaf phacelia (5%), and bigleaf sandwort (5%).

## Douglas-fir/birchleaf spiraea plant association (PSME/SPBE)

Four plots were used to study fire effects in the Douglas-fir/birchleaf spiraea plant association. Plots were located in three 1986 burns (Dark Canyon, Huckleberry and Crane Creek) and the Canal Burn of 1989. The Canal Burn plot pre-existed and was resampled in the first and fifth years after the fire. The Huckleberry plot was established and sampled for the first time the year after the fire and again five years later. The Dark Canyon and Ryder Creek plots were established and read the first year after the burns. Two plots were located on severe burns; two plots were located on light burns. Elevations ranged from 4560 ft to 5520 ft (avg.= 4898 ft). Plots were located on slopes from 20-50% (avg.= 40%) and north, east and south aspects.

### Severe burn findings

All trees were killed by the intense fire.

Birchleaf spiraea cover increased slightly from first to fifth year following the burns. Snowbrush ceanothus was recorded only in the fifth year (10% cover) on the Huckleberry plot.

Pinegrass, elk sedge, and heartleaf arnica were the primary species present the year after the fire. Prickly lettuce and spreading groundsmoke occurred as pioneers the first year following the burn on areas devoid of rhizomatous plants. Plants entering the fifth year at the Huckleberry plot were yarrow, tall annual willowweed, cheatgrass, and soft chess.

### Light burn findings

No trees were killed by the underburn. Ponderosa pine and Douglas-fir both survived well from the pre-burn community dominated by pine (cover = 25% dominant/codominant trees; 15% intermediate and suppressed trees; 5% poles; 1% saplings). Douglas-fir accounted for 5% cover in the intermediate category.

Creeping Oregon-grape made a slight increase in year five while spiraea remained constant throughout the post-fire sampling period.

Pioneering the first year after the fire was dogbane. Herbaceous species remaining constant throughout were tailcup lupine and elk sedge. Making increases in the fifth year were yarrow, heartleaf arnica, showy aster, Idaho fescue, and pinegrass. These were stimulated by the light disturbance.

Litter increased, bare ground decreased, and moss cover increased over the five-year sample period.

### Other findings

The light burn on Echo Ridge in Big Sheep Canyon killed the bitterbrush plants that were incidental on this site. No regenerating bitterbrush were observed in years one or five.

### Summary

The light burn was especially beneficial in the following ways:

- stimulated pinegrass
- did not allow annual bromes to enter the community
- provided higher coverages by perennial forbs
- increased the biological diversity and vitality of included plant species
- provided higher moss cover (15%)

**Douglas-fir/birchleaf spiraea plant association (PSME/SPBE) (n=3)**

| Burn Intensity | ---Severe--- * (n=2) | | ------Light------- (n=1) | | |
|---|---|---|---|---|---|
| **Species** | 1 | 5 | PRE | 1 | 5 |
| Trees | | | | | |
| Douglas-fir (PSME) | 0 | 0 | ✳5 | 5 | 5 |
| ponderosa pine (PIPO) | 0 | 0 | 40 | 35 | 40 |
| Shrubs | | | | | |
| birchleaf spiraea (SPBE) | 6 ◆(3-10) | 8 | 10 | 10 | 10 |
| snowbrush ceanothus (CEVE) | 0 | 10 | 0 | 0 | 0 |
| creeping Oregon-grape (BERE) | 0 | 1 | 3 | 1 | 5 |
| Grasses/Sedges | | | | | |
| pinegrass (CARU) | 4 (3-5) | 10 | 35 | 18 | 70 |
| elk sedge (CAGE) | 1 (1-1) | 1 | 3 | 5 | 3 |
| annual bromes (BROMU) | 0 | 7 | 0 | 0 | 0 |
| Idaho fescue (FEID) | 0 | 0 | 3 | 0 | 10 |
| Perennial Forbs | | | | | |
| heartleaf arnica (ARCO) | 1 (1-1) | 0 | 10 | 1 | 5 |
| western yarrow (ACMIL) | 0 | 3 | 5 | 4 | 10 |
| tailcup lupine (LUCA) | 1 (0-1) | 1 | 20 | 10 | 10 |
| showy aster (ASCO) | 0 | 1 | 1 | 1 | 5 |
| arrowleaf balsamroot (BASA) | 0 | 0 | 5 | 1 | 30 |
| Annual Forbs | | | | | |
| prickly lettuce (LASE) | 0 | 1 | 0 | 0 | 0 |
| tall annual willowweed (EPPA) | 0 | 3 | 0 | 0 | 0 |
| Litter | 24 (20-27) | 81 | 80 | 35 | 70 |
| Bare Ground | 62 (44-79) | 12 | 0 | 20 | 10 |
| Moss | 0 | 1 | 5 | 0 | 15 |

* Both plots established after the fire. Data for year 5 comes from 1 plot only.
✳ Average Cover (%)
◆ Range of Cover (%)

## PSME/SPBE

Plot 807 Established - 1983 Burned lightly - 1989 Canal Fire

Echo - Big Sheep Ridge, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

August 1983 – Ponderosa pine dominated the overstory (40%). Douglas-fir was present in the overstory (5%) and in the understory (5%). The understory was dominated by pinegrass (35%) with spiraea a component at 10%. Other herbaceous plants of note were heartleaf arnica (10%), tailcup lupine (20%), arrowleaf balsamroot (5%), and yarrow (5%).

August 1989 – No trees were killed by the light underburn. Portions of the herbaceous/shrub understory were underburned.

August 1990 – The fire caused minor changes to the composition the first year after the fire. Spiraea, elk sedge, and yarrow remained unaffected. Pinegrass flowered and resprouted vigorously.

July 1995 – The most notable change was in pinegrass cover. It doubled from pre-burn coverage and increased from 30% to 70% between years 1 and 5 following the burn. Spiraea remained constant at 10%. Herbaceous vegetation changes of note were a six-fold increase in balsamroot (30%), doubling of yarrow to 10%, and increases by showy aster and Idaho fescue.

## Douglas-fir/common snowberry plant association (PSME/SYAL)

Three plots were sampled for fire effects in year one and five following burns on sites pertaining to this plant association. The fires were Eagle and Huckleberry in 1986. Each plot was installed after the fires and resampled the first and fifth years after the burn. The three sites burned severely. Elevations ranged from 4350 ft to 4580 ft (avg. = 4557 ft). The three plots occur on north, south, and west aspects. Slopes averaged 35%.

Severe burn findings

All trees were killed by the severe burn.

Shrubs were dominated by spiraea, common snowberry, and snowbrush ceanothus after the burns. Ceanothus averaged 11% cover; spiraea and snowberry were reduced by the fires but remained constant over the post-burn sampling period.

Pinegrass, Idaho fescue, and heartleaf arnica remained constant at low coverage levels. Western fescue increased from the first to the fifth year in cover. Tailcup lupine decreased after the first year. Entering the sites by the fifth year following the burns was soft chess, yarrow, bull thistle, tall annual willowweed and prickly lettuce.

From the first to fifth years after the burns litter increased (21% to 66%), bareground decreased (59% to 16%), and moss entered in the fifth year at 4%.

Summary

These three sites experienced stand-replacement burns. Douglas-fir/snowberry communities historically underburned (Johnson and Simon 1987). The low coverages after five years of snowberry, pinegrass, and western fescue attest to the severity of the burn on this vegetation and its slowness to rebound.

Annual rye had been seeded on the intensely burned sites but had essentially left the scene by the fifth year of sampling. Orchardgrass had increased to 6% cover on two of three intensely burned sites by the fifth year.

**Douglas-fir/common snowberry plant association (PSME/SYAL) (n=3)**

| Burn Intensity | -----Severe----- (n=3) | |
|---|---|---|
| **Species** | 1 | 5 |
| Shrubs | | |
| common snowberry (SYAL) | ✳2 | 2 |
| | ◆(1-4) | (1-4) |
| birchleaf spiraea (SPBE) | 1 | 2 |
| | (0-1) | (1-3) |
| snowbrush ceanothus (CEVE) | 1 | 11 |
| | (0-2) | (1-17) |
| Grasses | | |
| pinegrass (CARU) | 2 | 2 |
| | (1-3) | (1-2) |
| Idaho fescue (FEID) | 1 | 1 |
| | (0-3) | (0-1) |
| western fescue (FEOC) | t | 4 |
| | (0-1) | (0-8) |
| annual bromes (BROMU) | 0 | 7 |
| | | (1-14) |
| Ross' sedge (CARO) | t | 1 |
| | (0-1) | (1-1) |
| Perennial Forbs | | |
| heartleaf arnica (ARCO) | 1 | t |
| | (0-2) | (0-1) |
| tailcup lupine (LUCA) | 5 | 1 |
| | (0-15) | (0-1) |
| yarrow (ACMIL) | 0 | 1 |
| | | (1-1) |
| bull thistle (CIVU) | 0 | 3 |
| | | (0-5) |
| Annual Forbs | | |
| tall annual willowweed (EPPA) | 0 | 2 |
| | | (1-3) |
| prickly lettuce (LASE) | 0 | 1 |
| | | (1-1) |
| Litter | 21 | 66 |
| | (4-52) | (55-78) |
| Bare Ground | 59 | 16 |
| | (38-84) | (11-20) |
| Moss | 0 | 4 |
| | | (0-10) |

✳ Average Cover (%)
◆ Range of Cover (%)

## Douglas-fir/mountain snowberry plant association (PSME/SYOR)

One plot pertaining to this plant association burned lightly in the Teepee Butte Burn of 1988. The plot is located at 5200 ft on a 5% slope with an easterly aspect. The plot pre-existed the fire and was resampled the first and fifth years following the burn.

Light burn findings

Douglas-fir and ponderosa pine were retained by the light underburn.

Mountain snowberry declined after the fire but by the fifth year had increased above pre-burn coverages to 20%. Constant throughout pre-burn and post-burn sampling periods was baldhip rose.

Interestingly species known to increase with disturbance showed declines with this light burn! Declining from pre-burn coverages by the fifth-year sampling were yarrow, tailcup lupine, and Kentucky bluegrass. Increasing over the same period were pinegrass, Idaho fescue, and woods strawberry.

Litter increased dramatically (39% to 97%); bare ground declined (12% to 2%) and mosses remained constant at 1%.

**Douglas-fir/mountain snowberry plant association (PSME/SYOR) (n=1)**

| Burn Intensity | -----Light----- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | **1** | **5** |
| Shrubs | | | |
| mountain snowberry (SYOR) | *11 | 7 | 20 |
| baldhip rose (ROGY) | 3 | 3 | 4 |
| Grasses | | | |
| pinegrass (CARU) | 1 | 1 | 12 |
| Idaho fescue (FEID) | 2 | 4 | 8 |
| Kentucky bluegrass (POPR) | 35 | 23 | 11 |
| annual bromes (BROMU) | 3 | 3 | 2 |
| Perennial Forbs | | | |
| western yarrow (ACMIL) | 9 | 8 | 3 |
| tailcup lupine (LUCA) | 14 | 24 | 11 |
| woods strawberry (FRVE) | 5 | 6 | 12 |
| Litter | 39 | 75 | 97 |
| Bare Ground | 12 | 13 | 2 |
| Moss | 1 | 7 | 1 |

* Average Cover (%)

## PSME/SYOR

**Cold Sprints C&T #3 Established - 1957 Burned lightly - 1988** Teepee Butte Fire
**Downey Saddle, Hells Canyon NRA, Wallowa-Whitman National Forest**

**May 1976 – Kentucky bluegrass dominated from past overgrazing by sheep and cattle. Mountain snowberry was the dominant shrub (11%); mountain big sagebrush (4%). Tailcup lupine was the dominant forb (14%).**

**October 1988 – Douglas-fir and ponderosa pine were underburned with only minor mortality to occasional saplings.**

**July 1989 – Kentucky bluegrass and tailcup lupine became co-dominant the year after the fires. Mountain snowberry declined in foliar cover but resprouted readily from basal buds. Yarrow and woods strawberry remained constant.**

## Douglas-fir/pinegrass plant association (PSME/CARU)

This major plant association of the Blue and Wallowa Mountains was represented by seven plots (two in the Wallowas; 5 in the Blues). On six different fires (Joseph-Starvation, Cornet, Sunflower, Huckleberry from 1986; Ryder Creek from 1987; and Canal from 1989). Fire severities were as follows: 3 plots severely burned; 3 plots moderately burned; one plot lightly burned. The Joseph-Starvation and Canal plots pre-existed the fires and were resampled the first and fifth years after the burns. The other plots were established after the fires and were sampled in the first and fifth years following the burns. Plot elevations averaged 5030 ft (4200 to 6400 ft). Aspects represented were north, east, and south. Slopes averaged 35% (10% to 60%).

Severe burn findings

All trees were killed by the stand-replacing fire. The pre-burn stands were dominated by large ponderosa pine (25% cover) and Douglas-fir (10% cover) in the tree overstory. Trees were essentially absent in the tree understory layers (Douglas-fir pole-sized trees = 1%).

Shrubs are weakly present in this plant association, but spiraea, common snowberry, and snowbrush ceanothus did occur in post-burn stands at low coverages (1% or less).

Pinegrass dominates this plant association in all seral stages (avg.= 54% in the Wallowas, 42% in the Blues); Johnson and Simon 1987, Johnson and Clausnitzer 1992. In the first year following the burns, pinegrass declined to 12% coverage; by year five it had increased to 20%.

Decreasing as a result of the intense burn were heartleaf arnica, woods strawberry, and lupines. Species entering the sites as pioneers were yarrow, prickly lettuce, and fireweeds. Tall annual willowweed made dramatic increases on plots in the fifth year.

Litter cover increased the first year after the fire, bare ground increased tenfold (9% in year 5), and mosses decreased sharply (30% to 4%). Liverworts were present the first year after the burns.

Moderate burn findings

In this plant association the moderate burn resulted in overstory ponderosa pine and Douglas-fir trees being retained while some pole- and sapling-sized trees were consumed.

Creeping Oregon-grape exhibited fifth-year increases over first-year coverages.

Pinegrass increased its cover with the moderate burn. Also increasing was yarrow (1% to 15%). Tailcup lupine entered the year after the burn and was dominant with yarrow among forbs in the fifth year.

Litter declined slightly following the burns and bare ground increased. This was attributed to ungulate trailing and their increased usage following the burn. Mosses increased slightly to 5% after the burns.

Light burn findings

The light underburn retained all pine and Douglas-fir overstory trees on the site. After five years, 10 new ponderosa pines had established beneath older trees on areas where mineral soil had been exposed. But for the most part the duff had not been burned by the fire. No Douglas-fir seedlings had yet emerged.

Shrub composition remained minor throughout the sampling periods. Present were common snowberry, creeping Oregon-grape, baldhip rose, birchleaf spiraea, and snowbrush ceanothus.

Pinegrass increased from year one to year five (15% to 40%). As with most responses from burning in this plant association, pinegrass plants set seed and dispersed it to increase its vitality. Also increasing during the same timeframe were yarrow, elk sedge, strawberries, and lupine. Leaving the post-burn community by the fifth year was prickly lettuce, miner's lettuce, bigleaf sandwort, and Alaska oniongrass (*Melica subulata*).

Litter increased and bare ground dramatically declined from first to fifth years following the burn. Moss was a minor component.

Other findings

Fires generally increase species diversity by providing niches for plants not found in later seral stages. The severe burns sampled in Douglas-fir/pinegrass communities provided a doubling of species from the first to fifth years (avg.= 12 in year 1; 24 in year 5). Moderate and light burns resulted in less dramatic shifts by plant species.

Prickly lettuce and miner's lettuce are important constituents of the pioneering first year after severe burns. They not only provided a quick cover but also were found to be used extensively by elk and deer.

Grasses other than pinegrass were good performers. Western fescue provided rank growth (bunches up to 5 inches high) as it flourished in the fifth-year samples. Seeded exotic species could not compete well with pinegrass. Orchardgrass maintained a 4% cover on one plot and was relict on another after five years.

Summary

Moderate and light burns were best for pinegrass enhancement. On severely burned areas it declined 80% the first year after the fires compared to only a 40% decrease on moderate burns. Western fescue tended to increase on moderate and severe burns. It was absent on light burns. Severe burns were very detrimental to lupines. Moderate burns enhanced their occupancy however. Fireweeds needed a severe or moderate burn in order to take up occupancy on the burned site the year after the fire. Mosses demonstrated the greatest increase on severe burns with a coverage of the bare ground averaging 17% after five years.

**Douglas-fir/pinegrass plant association (PSME/CARU) (n=3)**

| Burn Intensity | ---------Severe--------- * (n=1) | | | ---------Moderate-------- ▲ (n=1) | | | -------Light------ (n=1) | |
|---|---|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** | **1** | **5** |
| Trees | | | | | | | | |
| Douglas-fir (PSME) | ✳**10** | **0** | **0** | 25 | 25 | 25 | **10** | **10** |
| ponderosa pine (PIPO) | **25** | **0** | **0** | 18 | 18 | 18 | **40** | **40** |
| Shrubs | | | | | | | | |
| birchleaf spiraea (SPBE) | **0** | **0** | **0** | 0 | 0 | 0 | **1** | **1** |
| common snowberry (SYAL) | **1** | **0** | **1** | 1 | 0 | 0 | **1** | **1** |
| snowbrush ceanothus (CEVE) | **0** | **0** | **0** | 0 | 0 | 0 | **1** | **1** |
| baldhip rose (ROGY) | **0** | **0** | **0** | 0 | 0 | 0 | **1** | **1** |
| creeping Oregon-grape (BERE) | **0** | **0** | **0** | 1 | 1 | 5 | **0** | **1** |
| Grasses/Sedges | | | | | | | | |
| pinegrass (CARU) | **30** | **12** | **20** | 35 | 30 | 85 | **15** | **40** |
| western fescue (FEOC) | **1** | **0** | **0** | 0 | 1 | 0 | **0** | **0** |
| elk sedge (CAGE) | **5** | **0** | **0** | 1 | 5 | 0 | **3** | **5** |
| Perennial Forbs | | | | | | | | |
| heartleaf arnica (ARCO) | **15** | **9** | **3** | 0 | 0 | 0 | **0** | **0** |
| woods strawberry (FRVE) | **5** | **0** | **1** | 1 | 3 | 0 | **1** | **2** |
| lupines (LUPIN) | **50** | **7** | **3** | 0 | 1 | 10 | **0** | **1** |
| western yarrow (ACMIL) | **0** | **0** | **3** | 1 | 1 | 15 | **1** | **5** |
| western hawkweed (HIAL2) | **3** | **0** | **1** | 1 | 0 | 1 | **3** | **3** |
| bigleaf sandwort (ARMA3) | **3** | **4** | **3** | 0 | 0 | 0 | **1** | **0** |
| Annual Forbs | | | | | | | | |
| prickly lettuce (LASE) | **0** | **10** | **1** | 0 | 1 | 0 | **1** | **0** |
| fireweeds (EPILO) | **0** | **3** | **15** | 0 | 1 | 15 | **0** | **1** |
| Litter | **70** | **81** | **67** | 80 | 65 | 65 | **65** | **95** |
| Bare Ground | **1** | **10** | **9** | 1 | 1 | 10 | **20** | **1** |
| Moss | **30** | **6** | **4** | 0 | 0 | 5 | **0** | **1** |

* The Joseph-Starvation Burn plot was selected to portray severe burn results.
▲ The Canal Burn plot was selected to portray the moderate burn results.
✳ Average Cover (%)

PSME/CARU

Plot 891 Established - 1982 Burned moderately - 1989 Canal Fire

Big Sheep Creek Canyon, Wallowa Valley Ranger District, Wallowa-Whitman National Forest

August 1982 – Douglas-fir veterans of past underburns composed the tree overstory (25% cover). In the tree understory, Douglas-fir saplings (15%) occurred in a herbaceous layer dominated by pinegrass (35%).

August 1989 – The moderate burn underburned with some mortality to intermediate and pole-sized trees. Sapling Douglas-fir trees succumbed. Rocks of the outcropping retained heat allowing the fire to kill associated small dimension trees.

August 1990 – Pinegrass returned to near pre-burn coverage (30%) with abundant flowering and seed production. Elk sedge increased to 5%. The only appreciable forb in the post-burn community was woods strawberry (3%).

July 1995 – The fifth year following the burn, pinegrass clearly dominated the community with cover at 85%. Also flourishing were yarrow (15%), pearly everlasting (10%), annual fireweeds (15%), and tailcup lupine (10%). Creeping Oregon-grape had increased from 1% to 5% over the five years since the fire.

## Grand Fir/Beadlily Plant Association (ABGR/CLUN)

The Ryder Creek Burn of 1987 burned a forested bottom in Fitzwater Gulch adjacent to the North Fork John Day River. A post-burn plot was installed to follow the response of vegetation. The site burned very intensely killing all trees and leaving only a small unburned "island" where shrubs and herbaceous vegetation were unaffected. The site is in a cold air ponding flat (15% slope) at 3830 ft elevation with a southwest aspect. The plot was resampled the first and fifth years after the burn.

Severe burn findings

All overstory and understory trees (ponderosa pine and western larch) were killed by this burn. Lodgepole pine logs contributed to the fire intensity. Understory trees killed by the fire (grand fir, Douglas-fir, and lodgepole pine) also contributed to fire behavior. By the fifth year following the fire, lodgepole pine and Douglas-fir seedlings covered the plot (486 trees/acre). Lodgepole pine was dominant with 3-foot heights; Douglas-fir was subordinate with ten-inch heights. Lodgepole dominated with a 2:1 ratio. Some grand fir seedlings were beginning to establish.

Shrubs increasing five years after the burn were thimbleberry (1% to 10%), snowbrush ceanothus (3% to 15%), and creeping Oregon-grape (1% to 20%). Shrubs entering the site as a result of the fire were swamp currant, raspberry, common snowberry, blue elderberry, syringa, and Bebb's willow. Twinflower retained its coverage from the post-burn sample based on the unburned "island" population. Soapberry pioneered the site in the first year but was gone by the fifth year.

The fireweed present in the first-year sample was absent in the fifth year. Herbaceous vegetation increasing over the 5-year period were beadlily, Ross' sedge, and northwestern sedge. A predictable fifth-year opportunist coming into the community for the first time was pearly everlasting.

Interestingly liverworts covered 50% of the ground surface the year after the burn. In the fifth year they were gone! Their replacement was by mosses (*Polytrichum juniperum*) which had increased from 5% to 65% through this period.

Other findings

The change from the first year to the fifth year with the vegetation on this site was dramatic. Pioneering plants following the fire had now been replaced in successional order and time. Gone were prickly lettuce, miner's lettuce, bigleaf sandwort, fireweeds, and liverworts. The increase in vegetation was notable not only in species richness (20 in 1988; 30 in 1993) but also in life forms affecting layers and structure. Shrub species numbered six in the first year after the burn. By the fifth year they numbered twelve. The deep soils of this site were not "damaged" by this intense fire. This coupled with the cool, moist microenvironment of the canyon bottom allowed the herbaceous and shrub component of the grand fir/beadlily plant association to rebound vigorously and rapidly.

**Grand fir/beadlily plant association (ABGR/CLUN) (n=1)**

| Burn Intensity | ------Severe------ | |
|---|---|---|
| **Species** | 1 | 5 |
| Trees | | |
| grand fir (ABGR) | 0 | 0 |
| western larch (LAOC) | *2 | 5 |
| Douglas-fir (PSME) | 5 | 10 |
| lodgepole pine (PICO) | 0 | 20 |
| Shrubs | | |
| twinflower (LIBO2) | 3 | 3 |
| snowbrush ceanothus (CEVE) | 3 | 15 |
| creeping Oregon-grape (BERE) | 1 | 20 |
| thimbleberry (RUPA) | 1 | 10 |
| swamp currant (RILA) | 0 | 1 |
| common snowberry (SYAL) | 0 | 1 |
| blue elderberry (SARA) | 0 | 1 |
| Bebb's willow (SABE) | 0 | 5 |
| syringa (PHLE2) | 0 | 1 |
| Sedges/Grasses | | |
| pinegrass (CARU) | 10 | 5 |
| sedges (CARO, CACO) | 3 | 6 |
| Perennial Forbs | | |
| beadlily (CLUN) | 5 | 10 |
| pearly everlasting (ANMA) | 0 | 1 |
| fireweeds (EPAN, EPWA) | 2 | 0 |
| Litter | 40 | 35 |
| Bare Ground | 1 | 1 |
| Moss | 5 | 65 |
| Liverworts | 50 | 0 |

* Average Cover (%)

## ABGR/CLUN

Plot 9208 **Established - Sept. 1987 Burned severely - August 1987 Ryder Creek Fire**
**Fitzwater Gulch, North Fork John Day Ranger District, Umatilla National Forest**

**September 1987 – Fire burned severely, killing all trees and consuming a high percentage of the downed woody material. Note the white ash deposits.**

**August 1988 – The first year after the fire, liverworts covered 50% of the site and constituted the most dominant plant in the community. Pinegrass responded rapidly with sprouting and flowering (10% cover). Unburned islands populated by twinflower, beadlily, and sedges provided sources of seed for the burned area.**

**September 1993 – Five years after the burn, liverworts and fireweeds were gone. Shrubs now dominated. Lodgepole pine (20%), Douglas-fir (10%), and western larch (5%) seedlings were abundant. Principal shrubs were snowbrush ceanothus (15%), creeping Oregon-grape (20%), and thimbleberry (10%).**

## ABGR/CLUN

Plot 9208 Established - Sept. 1987 Burned severely - August 1987 Ryder Creek Fire
Fitzwater Gulch, North Fork John Day Ranger District, Umatilla National Forest

September 1987 – Fire burned severely, killing all trees and consuming a high percentage of the downed woody material. Note the white ash deposits.

August 1988 – The first year after the fire, liverworts covered 50% of the site and constituted the most dominant plant in the community. Pinegrass responded rapidly with sprouting and flowering (10% cover). Unburned islands populated by twinflower, beadlily, and sedges provided sources of seed for the burned area.

September 1993 – Five years after the burn, liverworts and fireweeds were gone. Shrubs now dominated. Lodgepole pine (20%), Douglas-fir (10%), and western larch (5%) seedlings were abundant. Principal shrubs were snowbrush ceanothus (15%), creeping Oregon-grape (20%), and thimbleberry (10%).

## Grand fir/twinflower plant association (ABGR/LIBO2)

A plot located on Summit Ridge west of Buckhorn on Wallowa Valley RD was moderately burned by a small fire in 1986. The plot represented an early seral stage of the grand fir/twinflower plant association. It is on a gentle 10% slope with a northwesterly aspect at 5280 ft elevation. The pre-burn community was dominated by western larch, Douglas-fir, and lodgepole pine. The plot was resampled the first and fifth years after the burn.

### Moderate Burn findings

The fire killed all lodgepole pine, Douglas-fir, and grand fir. These species had all been present in pole-sized trees (lodgepole pine, larch) and saplings (Douglas-fir, grand fir). Western larch was partially affected with some trees killed (5% poles); but others survived (10% intermediate size trees). By the fifth year following the burn, lodgepole pine seedlings were dominant across the plot. Western larch, Douglas-fir, and grand fir seedlings were also present.

Principal shrubs that declined were the two pre-burn dominants; twinflower and big huckleberry. By the fifth year both were reasserting their dominance. Utah honeysuckle was severely impaired by the burn. Capitalizing on the fire were two shrubs not present in the pre-burn community: creeping Oregon-grape (which entered the first year after the fire) and Scouler willow (which entered following the first year sample).

Among the herbaceous plants present in the pre-burn community, Columbia brome and woods strawberry were absent in the first year following the fire. They both responded vigorously by the fifth year. Pinegrass and Ross' sedge entered the site for the first time following this moderate burn. Plants that maintained their coverage through the burn were Piper's anemone, fireweeds, and round-leaved violet.

Surface features did not change markedly. Litter cover increased and bare ground declined from pre-burn averages based on coniferous needle fall the first year and an increased herbaceous component the following years. Mosses stayed at about 5% cover throughout the period. Liverworts entered the community in the first year after the burn (4%) but had left by the fifth year.

### Summary

This moderate burn did little to change the composition except for lowering coverages by principal species. By the fifth year they began reasserting their prior positions relative to one another within the post-fire community. For example, big huckleberry and twin flower each had declined ten-fold from pre-burn coverages at year five. A slight dominance by huckleberry over the twinflower reflected the slightly warmer and drier post-burn microenvironment favoring huckleberry. Aggressive to the open growing portions of the plot were opportunistic species (e.g., Scouler willow, pinegrass, Ross' sedge, and Columbia brome).

**Grand fir/twinflower plant association (ABGR/LIBO2) (n=1)**

| Burn Intensity | -----Moderate----- (n=1) | | |
|---|---|---|---|
| **Species** | **PRE** | 1 | 5 |
| Trees | | | |
| grand fir (ABGR) | *5 | 0 | 3 |
| Douglas-fir (PSME) | 20 | 0 | 3 |
| western larch (LAOC) | 15 | 5 | 5 |
| lodgepole pine (PICO) | 35 | 0 | 15 |
| Shrubs | | | |
| twinflower (LIBO2) | 70 | 0 | 7 |
| big huckleberry (VAME) | 65 | 3 | 11 |
| Utah honeysuckle (LOUT2) | 5 | 1 | 0 |
| creeping Oregon-grape (BERE) | 0 | 1 | 1 |
| Scouler willow (SASC) | 0 | 0 | 3 |
| Grasses/Sedges | | | |
| Columbia brome (BRVU) | 5 | 0 | 8 |
| pinegrass (CARU) | 0 | 0 | 3 |
| Ross' sedge (CARO) | 0 | 2 | 1 |
| Perennial Forbs | | | |
| woods strawberry (FRVE) | 10 | 0 | 4 |
| Piper's anemone (ANPI) | 1 | 1 | 1 |
| round-leaved violet (VIOR2) | 5 | 1 | 1 |
| fireweeds (EPAN, EPPA) | 1 | 1 | 3 |
| Litter | 40 | 86 | 83 |
| Bare Ground | 15 | 6 | 9 |
| Moss | 5 | 4 | 6 |
| Liverworts | 0 | 4 | 0 |

* Average Cover (%)

## Grand fir/big huckleberry plant association (ABGR/VAME)

Three plots were selected to study fire's effects on the communities of this plant association. One plot was burned lightly by the Twin Lakes Burn of 1994. It is located at 5450 ft elevation on a 30% slope with a southerly aspect. Another Twin Lakes Burn plot, burned severely, is located at 5450 ft elevation on a 30% slope with a northwesterly aspect. The third plot was burned severely on the Deardorff Burn of 1986. It is located at 5780 ft elevation on a 60% slope with a southeasterly aspect.

The findings from the Twin Lakes plots are first-year data. The findings from the Deardorff Burn plot are from first- and eighth-year samples following the burn.

### Severe burn findings

All tree species were killed by stand-replacement burns. Grand fir dominated this late seral community before the burn (30% cover by dominant and codominant trees; 25% cover by intermediate and suppressed trees; 15% cover by poles; 10% cover by saplings). The only other principal tree species present was Douglas-fir (10% cover dominant and codominant trees).

Sitka alder was a component on one of the plots prior to the fire. It was killed by the burn. Utah honeysuckle was also killed by the intense burn. Big huckleberry declined dramatically on the severely burned sites. The only shrub to increase with the burn was spiraea (5% to 11%). As a result of the intense burn, snowbrush ceanothus and Scouler willow came onto the site.

One of the plots had a dominant seral stage defined by bracken. The deep-seated rhizomes of this species enabled it to survive and flourish with this burn. Heartleaf arnica declined the first year after the burn. Fireweeds entered the communities after the fire.

Litter cover decreased and bare ground increased the first year after the burn. Cryptogam coverage increased markedly. Liverworts entered the site the first year following the burn. The fast response by cryptogams assisted in thwarting rainsplash, rill, and sheet erosion.

### Light burn findings

The underburn reduced the late seral grand fir coverage. The tree overstory was diminished (55% to 40%) and tree understory reduced as well (10% to 5%) the first year following the burn. The underburn was continuous with fire only scorching the basal portion of the large 30-40" diameter trees. A thicket of grand fir saplings only lost 30% of its occupants.

Utah honeysuckle was unaffected by the burn. Scouler willow seed was scarified by the light burn resulting in a dominating layer of shrub seedlings. Snowbrush ceanothus was another shrub found in the post-burn community at low coverage.

Of the pre-burn herbaceous plants, Ross' sedge and woods strawberry decreased with the light burn. Pioneering the burned area were fireweeds, prickly lettuce, thistle, and yellow salsify. Houndstongue was present as a rank weed.

The surface cover changed predictably the first year after the fire. Litter decreased; bare ground increased; moss cover went from a trace to 20%. Liverworts occurred at low coverage.

### Summary

Grand fir/big huckleberry forests are often burned with varying intensities. They may be the portion of a larger forest landscape that succumbs to stand-replacing fire fueled by down woody material and maintained by flashy fir crowns. Or they may be at the upper elevations in montane settings where the humidity and downslope winds may combine to lower the fire's intensity allowing it to burn moderately or underburn beneath the firs. Weather patterns and diurnal changes (e.g., humidity and wind) also influence the severity and extent of burning in these plant communities.

The light underburn in a late-seral grand fir/big huckleberry community brought a new shrub/herbaceous component to the site. Scouler willow, fireweeds, and snowbrush ceanothus defined the early seral stage of succession. The species richness increased (15

different species in the pre-burn community; 34 species in the post-burn community).

With stand-replacement burns, Scouler willow, snowbrush ceanothus, and fireweeds dominated the sites with fire mosses and liverworts. Ceanothus and bracken are fierce competitors that can become long-term dominants of the site and retard tree regeneration and other shrub and herbaceous vegetation. Species richness declined on the two severely burned plots to 65% of pre-burn levels (23 species to 15 species).

**Grand fir/big huckleberry plant association (ABGR/VAME) (n=2)**

| Burn Intensity | ---Severe--- (n=1) | | ----Light--- (n=1) | |
|---|---|---|---|---|
| **Species** | **PRE** | **1** | **PRE** | **1** |
| Trees | | | | |
| grand fir (ABGR) | **75** | **0** | 65 | 45 |
| Shrubs | | | | |
| Sitka alder (ALSI) | ***5** | **0** | 0 | 0 |
| Utah honeysuckle (LOUT2) | **10** | **0** | 1 | 1 |
| big huckleberry (VAME) | **45** | **1** | 0 | 0 |
| birchleaf spiraea (SPBE) | **5** | **11** | 0 | 0 |
| snowbrush ceanothus (CEVE) | **0** | **1** | 0 | 1 |
| Scouler willow (SASC) | **0** | **10** | 0 | 10 |
| Grasses/Sedges | | | | |
| pinegrass (CARU) | **1** | **1** | 0 | 0 |
| elk sedge (CAGE) | **1** | **0** | 0 | 0 |
| Ross' sedge (CARO) | **0** | **0** | 10 | 3 |
| Perennial Forbs | | | | |
| bracken (PTAQ) | **-*** | **65** | 1 | 0 |
| heartleaf arnica (ARCO) | **5** | **1** | 0 | 0 |
| fireweeds (EPILO) | **0** | **6** | 0 | 1 |
| sidebells pyrola (PYSE) | **10** | **0** | 1 | 0 |
| woods strawberry (FRVE) | **0** | **0** | 10 | 3 |
| Litter | **60** | **1** | 95 | 50 |
| Bare Ground | **1** | **5** | 0 | 30 |
| Moss | **20** | **60** | 1 | 20 |
| Lichen | **5** | **20** | 1 | 1 |
| Liverwort | **0** | **20** | 0 | 1 |

* Data unavailable for comparison
* Average Cover (%)

## ABGR/VAME

Plot 1221 Established - July 1985 Burned lightly - August 1994 Twin Lakes Fire
Pole Creek, Pine Ranger District, Wallowa-Whitman National Forest

July 1985 - Grand fir dominated the tree overstory (55%) and understory (10%). The most abundant herbaceous plants were Ross' sedge (10%) and woods strawberry (10%). Shrubs were almost absent.

October 1994 - The site was burned lightly. The fire understory coverage by 50% (majority were pole sized).

August 1995 - The most prolific understory plant was Scouler willow (10%) the first year after the burn. Strawberry and sedges were the most abundant herbaceous plants.

## Grand fir/birchleaf spiraea plant association (ABGR/SPBE)

Three plots were installed in vegetation representing the grand fir/spiraea plant association following the Deardorff, Huckleberry, and Crane Creek Fires of 1986. The plots occur on east, south, and north aspects at elevations ranging from 4740 ft to 5730 ft (avg. = 5077 ft). Slopes ranged from 30% to 55% (avg.= 43%). The fire burned moderately, leaving some patches of unburned vegetation on one plot, and burned severely on the other two plots. One burn was seeded aerially with the following species subsequently establishing on the plot area: orchardgrass, perennial rye, and clover. Sampling occurred the first year and fifth year after the burns on Huckleberry and Crane Creek plots; the eighth year on the Deardorff Burn plot.

Severe burn findings

The fire killed virtually all trees on the site. By the fifth year ponderosa pine and lodgepole pine were re-entering the site. Lodgepole pine dominated by an 85:15 ratio over ponderosa pine. Lodgepole pines were 4 feet tall after the fifth year.

Scouler willow and snowbrush ceanothus both entered the sites following the burn. By year five ceanothus cover averaged 32% on the two sites. Spiraea remained constant at 7% cover over the post-burn period. Creeping Oregon-grape was present at low cover on both plots.

Herbaceous vegetation made notable increases in the fifth year. Yarrow, pinegrass, western fescue, and woods strawberry all increased. Elk sedge capitalized on the bare ground and dramatically entered the community in the fifth year following the fire.

Litter increased; moss and bare ground declined over the 5-year period. Liverworts and mosses were quick to pioneer in the first year. The bare ground in year five was attributed in large part to disturbance from pocket gophers and elk trailing.

Moderate burn findings

All trees were killed by the burn except where an unburned patch retained Douglas-fir saplings. The pre-burn forest consisted of western larch, Douglas-fir, ponderosa pine, and grand fir trees. In the fifth-year sampling, ponderosa pine and Douglas-fir seedlings dominated the pioneering tree population but western larch and grand fir were also represented.

The first year after the burn, spiraea was the most dominant plant found on the site. By the fifth year it had doubled its coverage to 11% and retained its dominance of the site. Entering the community as a result of the burn were snowbrush ceanothus and Scouler willow. By the fifth year other shrubs occurring were rose, common snowberry, Oregon boxwood, mountain-mahogany, and kinnikinnick.

The herbaceous native plant cover did not appreciably change from the first year to the fifth year with the exception of elk sedge, which increased slightly. Pinegrass dominated the herbaceous vegetation with showy aster, yarrow, and woods strawberry also prominent in the post-burn community.

Litter coverage increased and bare ground decreased over the 5-year period. Mosses were present at 8% cover in the first year after the burn. By the fifth year they had increased their cover five-fold to 43%!

Summary

The severe burn was favorable to the aggressive rhizomatous plants (pinegrass and elk sedge) as well as snowbrush ceanothus. The moderate burn promoted spiraea more than the severe burn and was less favorable to ceanothus, elk sedge, and pinegrass colonization.

The herbaceous exotic seedings showed dramatic change from the two sampling periods. Orchardgrass declined from 34% cover to 7%; perennial rye and clover both left the community by the fifth year.

**Grand fir/birchleaf spiraea plant association (ABGR/SPBE) (n=3)**

| Burn Intensity | -----Severe----- (n=2) | | -----Moderate---- (n=1) | |
|---|---|---|---|---|
| **Species** | **1** | **5/8** | **1** | **5** |
| Trees | | | | |
| grand fir (ABGR) | **0** | -* | - | - |
| lodgepole pine (PICO) | **0** | ∗**3** ◆(1-5) | - | - |
| ponderosa pine (PIPO) | **t** (0-1) | **1** (1-1) | - | - |
| Shrubs | | | | |
| birchleaf spiraea (SPBE) | **8** (5-10) | **7** (3-10) | **5** | **11** |
| creeping Oregon-grape (BERE) | **3** (3-3) | **2** (1-3) | **0** | **0** |
| snowbrush ceanothus (CEVE) | **2** (1-3) | **32** (10-55) | **0** | **1** |
| Scouler willow (SASC) | **0** | **2** (0-3) | **0** | **1** |
| Grasses/Sedges | | | | |
| elk sedge (CAGE) | **0** | **13** **(5-20)** | **1** | **3** |
| pinegrass (CARU) | **10** (5-15) | **13** (5-20) | **4** | **4** |
| western fescue (FEOC) | **1** (0-1) | **3** (0-5) | **0** | **1** |
| Perennial Forbs | | | | |
| western yarrow (ACMIL) | **1** (0-1) | **5** (1-10) | **1** | **1** |
| woods strawberry (FRVE) | **1** (0-1) | **2** (0-3) | **1** | **2** |
| showy aster (ASCO) | **1** (0-1) | **3** (0-5) | **2** | **2** |
| Litter | **8** (5-10) | **52** (25-80) | **57** | **76** |
| Bare Ground | **25** (20-30) | **12** (3-20) | **10** | **7** |
| Moss | **10** (0-20) | **5** (0-10) | **8** | **43** |

* Data unavailable
∗ Average Cover (%)
◆ Range of Cover (%)

## ABGR/SPBE

Plot 9169 Established - August 1987 Burned severely -August 1986 Crane Creek Fire
North Fork John Day River Canyon, North Fork John Day Ranger District,
Umatilla National Forest

August 1987 – All trees were killed by the fire. The first year after the burn, spiraea dominated (10%) with creeping Oregon-grape (3%) and ceanothus (1%). Herbaceous vegetation was co-dominant by pinegrass and bigleaf sandwort (5% each).

July 1996 – In the 10th year after the burn, lodgepole pine and ponderosa pine seedlings populated the site with lodgepole dominant (4 ft tall) at 5% cover. Ceanothus had increased (10%) to co-dominate with spiraea in the shrub layer. Scouler willow had entered the community at 3%. Prominent herbaceous plants were elk sedge (20%), pinegrass (5%), western fescue (5%), and yarrow (10%).

## Grand fir/pinegrass plant association (ABGR/CARU)

A total of seven plots were established following four wildfires that pertain to this plant association. All of the burns were in the Blue Mountains. The distribution of plots is as follows:

Scalp Fire - 1986 2 plots sampled first and fifth years following the burn
Ryder Creek Fire - 1987 2 plots sampled first and fifth years after the burn
Deardorff Fire - 1986 1 plot sampled the first year after the burn
Snowshoe Fire - 1990 2 plots sampled the first year after the burn

The plots ranged in elevation from 4930 ft to 5940 ft (avg. = 5507 ft) with slopes averaging 30% (15% to 50%). Aspects were principally southerly (5 plots) with 1 plot each in northerly aspects and westerly aspects.

Fire intensities of the 7 plots were as follows: severe, 5 plots; moderate, 1 plot; partial, 1 plot.

### Severe burn findings

All overstory trees were killed in fires that burned severely. The tree understories were all killed by the burns. In the first year of resampling ponderosa pine (a fire seral tree) began to re-enter the communities. By the fifth year Douglas-fir was also entering the sites again. Grand fir was not yet capable of surviving owing to the modified microenvironment.

The shrub composition is minimal in this plant association in those communities late in succession. However pioneering the sites after the intense burns was a constant performer -- snowbrush ceanothus. After the fifth year it ranged from 1% to 20% (avg.= 12%). The only other shrub of note was creeping Oregon-grape which was found consistently in the first-year samples.

Pinegrass was highly constant throughout first and fifth year samples. It averaged 8% cover in first year samples and 17% in fifth-year samples. Elk sedge was another constant associate with pinegrass. Several herbaceous plants became prominent by the fifth year of sampling on harshly burned sites: yarrow, mountain brome, bull thistle, woods strawberry, and annual bromes (cheatgrass, hairy chess). Fireweeds and prickly lettuce entered the severe-burn sites the year after the burn and remained at low coverage in the fifth year.

Litter increased and bare ground declined between the first and fifth sample years. Cryptogams increased to 7%.

### Moderate burn findings

Overstory trees were retained in the moderately burned plot where Douglas-fir and ponderosa pine survived. Understory trees were killed by the fire. By the fifth year, 12 ponderosa pine and 5 Douglas-fir seedlings had established.

Shrub composition was light. Scouler willow and snowbrush ceanothus were both present at only 1% cover.

Pinegrass and elk sedge were quick to respond. Elk sedge made the greatest increase over the five years (3% to 10%). Entering the site in the fifth year were yarrow, mountain brome, bull thistle, western fescue, and woods strawberry. Interestingly, no annual bromes entered this moderately burned site.

Bare ground decreased in cover; litter cover remained relatively constant; and mosses increased over the five-year period.

### Partial burn findings

The tree overstory was retained to 55% cover by the sporadic light underburn.

Snowbrush ceanothus was the dominant shrub with a cover of 25%.

Pinegrass cover was the highest of all post-burn grand fir/pinegrass community plots at 55% cover the first year after the burn. Other herbaceous vegetation was scant.

### Other Findings

The grand fir/pinegrass plant association represents a classic Blue Mountain example of vegetation composition often referred to as being outside the historic range of variation

owing to lack of periodic underburns. The pine-dominated open understories with pinegrass and elk sedge are often overstocked and compositionally growing a disproportionate number of grand fir as a result. Only the moderate and mosaic-burned plots represent the fire effects usually associated with this plant association. It should not burn intensely if fire were within its normal cycle.

The Scalp Burn was planted to ponderosa pine and Douglas-fir. Interestingly, the plot with a southerly aspect had 28 Douglas-fir in the first sample year but by the fifth year only 9 remained. At the same elevation nearby on another plot, where the aspect was northerly, all planted stock (11 pine, 11 Douglas-fir) remained. The Douglas-fir were 3 ft tall on the southerly site; 4 ft tall on the northerly site.

Pioneering plants provide a protective foliar cover to the site in the first years following the burns. One of these, prickly lettuce, was highly present in the first year samples but dropped out of the community by the fifth year. Others that were constant in the first year samples but gone by the fifth year were cryptantha and miner's lettuce.

Species richness is enhanced by the retrogression to earlier seral stages. In the plots sampled the first year after the burn, the number of plant species averaged ten. In the fifth year the average number of plant species had increased to 21. By the return to late seral stages, grand fir/pinegrass plant communities average approximately 10 shrub and herbaceous species (Johnson and Simon 1987). Biological diversity is improved when early- and mid-seral stage forested stands occur as part of the coniferous forest landscape.

**Grand fir/pinegrass plant association (ABGR/CARU) (n=6)**

| Burn Intensity | -----Severe----- (n=5) | | -----Moderate---- (n=1) | |
|---|---|---|---|---|
| **Species** | **1** (n=5) | **5** (n=3) | **1** | **5** |
| Trees | | | | |
| grand fir (ABGR) | **0** | **0** | **0** | **0** |
| Douglas-fir (PSME) | **0** | ✳**1** ◆(0-3) | **20** | **25** |
| ponderosa pine (PIPO) | **5** (0-20) | -* | **10** | **13** |
| Shrubs | | | | |
| snowbrush ceanothus (CEVE) | **9** (3-30) | **12** (1-20) | **1** | **1** |
| creeping Oregon-grape (BERE) | **1** (1-2) | **0** | **0** | **0** |
| Scouler willow (SASC) | **t** (0-1) | **0** | **0** | **1** |
| Grasses/Sedges | | | | |
| pinegrass (CARU) | **8** (0-55) | **17** (1-30) | **5** | **5** |
| elk sedge (CAGE) | **2** (0-3) | **2** (0-5) | **3** | **10** |
| mountain brome (BRCA) | **0** | **3** (1-15) | **0** | **5** |
| annual bromes (BROMU) | **0** | **9** (3-26) | **0** | **0** |
| western fescue (FEOC) | **0** | **0** | **0** | **10** |
| Perennial Forbs | | | | |
| western yarrow (ACMIL) | **t** (0-1) | **3** (5-10) | **0** | **3** |
| bull thistle (CIVU) | **1** (0-3) | **5** (0-15) | **0** | **15** |
| fireweeds (EPILO) | **1** (0-3) | **1** (1-1) | **0** | **1** |
| woods strawberry (FRVE) | **0** | **2** (1-4) | **0** | **8** |
| Annual Forbs | | | | |
| prickly lettuce (LASE) | **1** (0-3) | **1** (0-1) | **1** | **0** |
| Litter | **33** (3-77) | **53** (40-80) | **35** | **30** |
| Bare Ground | **34** (15-30) | **20** (10-40) | **30** | **15** |
| Moss | **0** | **4** (0-10) | **0** | **10** |
| Lichen | **t** (0-1) | **3** (0-10) | **0** | **0** |

* Data unavailable
✳ Average Cover (%)
◆ Range of Cover (%)

## ABGR/CARU

Plot 9179 Established - August 1987 Burned severely - August 1986 Scalp Fire
Van Aspen Ridge, Bear Valley Ranger District, Malheur National Forest

August 1987 – The first year after the burn, bare ground was prevalent. Herbaceous plants of greatest prominence were pinegrass (20%) and heartleaf arnica (10%). Ceanothus had entered the community following the severe burn with a cover of 5%.

July 1995 – Eight years later pinegrass had increased to 30%. Heartleaf arnica had declined to 1% with strawberry (4%) and yarrow (5%) as the newest prominent forbs. Ceanothus had increased to a cover of 20%. Ponderosa pine and Douglas-fir had been planted and were co-dominant on the site at 3% cover each. No grand fir seedlings had yet established.

## Grand fir/grouse huckleberry plant association (ABGR/VASC)

The four plots selected to study fire effects in grand fir/grouse huckleberry communities were all in the Blue Mountains. The samples came from two 1986 fires -- Crane Creek and Clear. The plots were all established after the burns. The Crane Creek plots were resampled in the 10th year; the Clear burn plot was resampled in the fifth year. The plots ranged from 4680 ft to 6260 ft in elevation (average = 5070 ft) on east and south aspects with slopes averaging 20% (5% to 40%). Three plots were installed on severe burns and one plot on a moderately burned site.

### Severe burn findings

All trees were killed in the overstory and understory by stand-replacing fire. After 10 years lodgepole pine seedlings carpeted the sites covering 50% of the area! Western larch accounted for another 13% coverage and ponderosa pine seedlings entered the sites at 1% cover.

Grouse huckleberry was absent in the first year following the burn but responded well by the tenth year. Other shrubs in the post-burn community were spiraea, Scouler willow, snowbrush ceanothus, Oregon boxwood, soapberry, and creeping Oregon-grape. Especially noticeable was the colonization by ceanothus. It occupied a large portion of the sites with a coverage of 25% after 10 years. Only lodgepole pine seedlings and saplings had greater occupancy of the sites.

Pinegrass was the most prolific and rapid herbaceous plant to respond on the post-burn sites. Replacement of the pinegrass stand in one tenth-year plot sample had been achieved by silky lupine and strawberries (a combined 50% cover). Other herbaceous plants occupying the post-burn sites were fireweed, bull thistle, elk sedge, northwestern sedge, yarrow, and mountain brome. Prickly lettuce pioneered the site immediately after the burn but was absent by the tenth year.

Bare ground decreased, litter increased, mosses doubled, and lichens declined over the 10-year sampling period. Liverworts were pioneers in the first year but were absent by the 10th year.

### Moderate burn findings

The trees were killed by a stand-replacement burn except for unburned patches where lodgepole pine seedlings were spared. By the fifth year lodgepole pine seedlings carpeted the ground on the plot.

Grouse huckleberry resprouted in the first year and covered 4% of the plot after the fifth year. Only Scouler willow had a coverage to equal it among the shrubs.

Pinegrass was quick to occupy the burned ground and covered 4% of the area after 5 years. Other herbaceous plants were not encountered until the fifth year sampling. These were woods strawberry, tall annual willowweed, bull thistle, soft chess, and bigleaf sandwort.

The most notable ground cover was demonstrated by mosses, which occupied 2% of the surface after the first year but a hefty 56% by year five!

### Summary

Grouse huckleberry is a tenacious survivor of severe burns and readily re-occupies the exposed sites, which are often drier and colder than before the burn. Ceanothus needed the severe burns in order to germinate and establish. It was not found on the moderate burn. Lupines and strawberries (especially woods strawberry) were important early seral components of the severely burned site. Both western larch and lodgepole pine were significant colonizers of the severely burned grand fir/grouse huckleberry communities. A high percentage of bare ground in the tenth-year samples was a attributed to pocket gopher activity.

**Grand fir/grouse huckleberry plant association (ABGR/VASC) (n=4)**

| Burn Intensity | -----Severe----- (n=3) | | ----Moderate---- (n=1) | |
|---|---|---|---|---|
| **Species** | 1 | 10 | 1 | 5 |
| Trees | | | | |
| grand fir (ABGR) | 0 | 0 | 0 | 0 |
| western larch (LAOC) | 0 | ✳13 ◆(0-30) | 0 | 0 |
| lodgepole pine (PICO) | 0 | 50 (40-70) | 1 | 25 |
| Shrubs | | | | |
| grouse huckleberry (VASC) | 0 | 7 (5-10) | 1 | 4 |
| birchleaf spiraea (SPBE) | 3 (1-5) | 4 (0-10) | 0 | 0 |
| Scouler willow (SASC) | t (0-1) | 4 (0-10) | 0 | 4 |
| snowbrush ceanothus (CEVE) | 0 | 25 (0-75) | 0 | 0 |
| Grasses/Sedges | | | | |
| pinegrass (CARU) | 9 (3-20) | 7 (1-15) | 1 | 4 |
| elk sedge (CAGE) | 0 | 1 (0-1) | 1 | 1 |
| northwestern sedge (CACO) | 0 | 4 (0-10) | 0 | 1 |
| mountain brome (BRCA) | 0 | 2 (0-5) | 0 | 0 |
| Perennial Forbs | | | | |
| silky lupine (LUSE) | 0 | 8 (0-20) | 0 | 0 |
| strawberries (FRVE, FRVI) | t (0-1) | 17 (0-30) | 0 | 1 |
| western yarrow (ACMIL) | 0 | 2 (0-5) | 1 | 0 |
| bull thistle (CIVU) | t (0-1) | 1 (0-1) | 0 | 1 |
| fireweed (EPAN) | 2 (1-5) | 1 (1-1) | 0 | 1 |
| Annual Forbs | | | | |
| prickly lettuce (LASE) | t (0-1) | 0 | 0 | 0 |
| tall annual willowweed (EPPA) | 2 (1-5) | 1 (1-1) | 0 | 1 |
| Litter | 9 (1-20) | 17 (5-25) | 93 | 79 |
| Bare Ground | 30 (0-65) | 22 (10-35) | 5 | 4 |
| Moss | 13 (0-20) | 27 (5-45) | 2 | 56 |
| Lichen | 7 (0-10) | 2 (1-5) | 1 | 0 |

✳ Average Cover (%)
◆ Range of Cover (%)

## ABGR/VASC

Plot 9168 Established - August 1987 Burned severely - August 1986 Crane Creek Fire
North Fork John Day River Canyon, North Fork John Day Ranger District,
Umatilla National Forest

August 1987 – All trees were killed by the severe burn. The first year after the fire very little vegetation occurred on the site. Pinegrass dominated (3%). Scouler willow and spiraea were present as the only shrubs.

July 1996 – The 10th year after the burn lodgepole pine and larch seedlings almost fully occupied this site. Lodgepole pines dominated 2:1 over larch and outgrew them (6 ft tall to 2 ft tall). Grouse huckleberry was now the dominant shrub (5%). Herbaceous vegetation was dominated by strawberries (20%), pinegrass (5%), western fescue (5%), northwestern sedge (10%), and mountain brome (5%).

## Subalpine fir/elk sedge plant association (ABLA2/CAGE)

Two plots were established on severely burned sites following the Clear Burn in the Blue Mountains. The vegetation was sampled the first and fifth years following the burn. Elevations were 6860 ft and 7020 ft. Both plots had southerly aspects and were on gentle slopes (15%).

### Severe burn findings

All trees were killed by stand replacement fire in the overstory and understory.

Shrubs were essentially absent from the herbaceous-dominated understory.

Elk sedge responded rapidly and had increased to 11% coverage by the fifth year. Other herbaceous plants responding to pioneer the site in the first year were bigleaf sandwort and heartleaf arnica. By the fifth year the following plants had entered the community: yarrow, mountain brome, and tall annual willowweed.

Ground cover shifted from a dominance by bare ground the first year after the burn (avg.= 77%) to an average cover of 23% in the fifth year. Litter was responsible for the decrease in bare ground (avg.= 20% in year 1; 60% in year 5). Mosses were present at 1% in the fifth year after an absence in the first sample year.

### Summary

Similar to grand fir/pinegrass communities, these late seral communities are generally overstocked and vulnerable to severe stand-replacement fires as a result of fire exclusion from the system. They would normally have a fire-return interval of about 10-20 years and would burn moderately or lightly as a result. The lack of tree seedlings and low coverages by all other plants attests to the inability of community components to respond after the severe fire.

These sites were seeded with orchardgrass and timothy. In the first year these plants each covered 1% of the area. By the fifth year orchardgrass and timothy had both increased to 4% cover. The aggressive elk sedge mats were probably responsible for limiting the amount of increase by the exotic grasses.

**Subalpine fir/elk sedge plant association (ABLA2/CAGE) (n=2)**

| Burn Intensity | -----Severe----- (n=2) | |
|---|---|---|
| **Species** | **1** | **5** |
| Grasses/Sedges | | |
| elk sedge (CAGE) | ✶**2** ◆(1-2) | **11** (5-17) |
| mountain brome (BRCA) | **0** | **1** (1-1) |
| Perennial Forbs | | |
| heartleaf arnica (ARCO) | **1** (1-1) | **0** |
| bigleaf sandwort (ARMA3) | **1** (1-1) | **2** (1-2) |
| western yarrow (ACMIL) | **0** | **1** (0-1) |
| bull thistle (CIVU) | **0** | **1** (0-1) |
| Annual Forbs | | |
| tall annual willowweed (EPPA) | **0** | **4** (3-5) |
| Litter | **20** (13-26) | **60** (56-64) |
| Bare Ground | **77** (63-90) | **23** (14-32) |
| Moss | **0** | **1** (1-1) |
| Lichen | **0** | **t** (0-1) |

✶ Average Cover (%)
◆ Range of Cover (%)

## ABLA2/CAGE

Plot 706 Established - October 1986 Burned severely - August 1986 Clear Fire
Black Butte, Baker Ranger District, Wallowa-Whitman National Forest

October 1986 – Burned severely with all trees killed.

September 1987 – The first year after the fire bare ground was predominant (90%) on the high elevation, cold-dry sites. Exotic seedings introduced orchardgrass, timothy, cereal rye, and mountain brome. Elk sedge was the most abundant native plant (1%).

August 1992 – Five years later bare ground cover was down to 32%. Timothy and orchardgrass had increased to a total of 6%. However, elk sedge was aggressively colonizing with a cover of 17%. Tall annual willowweed was actively occupying the dry site at 5% cover.

## Subalpine fir/fool's huckleberry plant association (ABLA2/MEFE)

This plant association is found primarily in the Seven Devils Mountains of Idaho within the study area. Three Idaho-based plots were burned in 1994 by the Rapid River Fire; the other plot was burned by the Summit Fire in 1989. Two plots burned severely killing all trees. One of these plots was on gentle terrain (10% slope); the other on steep topography (60% slope). The other two plots were burned partially with portions being unburned, lightly burned, and severely burned. These two plots were on steep slopes.

### Severe burn findings

Tree mortality was complete. Engelmann spruce had dominated prior to the fire (average cover = 17% dominant/codominant trees; 10% intermediate/suppressed trees; 5% saplings). Subalpine fir dominated the tree understory layer (average cover = 5% poles; 15% saplings). Lodgepole pine cover averaged 5% in the intermediate size category. No tree response was observed after the first growing season.

Fool's huckleberry response was mixed. On the gentle slope the shrub suffered a high mortality with few plants resprouting. Beargrass was present in this stand and vigorously resprouted in the first year from its thick rhizomes.

On the steep slope the fool's huckleberry vigorously resprouted on the severely burned site with 6- to 8-inch sprouts the first year following the burn. The most common herbs on the severely burned sites were fireweeds, arnica, and butterweed (*Senecio streptanthifolius*). The fireweeds were invaders; the others were endurers. The first year following the burn provided an influx by liverworts and mosses on the ash where downed logs had been consumed.

### Partial burn findings

The Oregon site (north of Hat Point) was spottily burned with a mosaic resulting of unburned, lightly burned, and severely burned vegetation. This plot was sampled in the fifth year as well as the first year following the burn. The pre-burn stand consisted of Engelmann spruce, subalpine fir, and lodgepole pine dominating the tree overstory as dominant and codominant trees (total cover = 55%) and as intermediate and suppressed trees (cover = 10%). Spruce poles constituted a tree understory cover of 10%. Subalpine fir saplings completed the tree composition at 5% cover.

Heat had singed and browned the leaves of fool's huckleberry the year of the burn. It had also burned about the bases of the shrubs. In the first-year sample the branches were dead and very little basal sprouting was seen. By the fifth year, the shrubs were actively sending up sprouts and had increased to 20% coverage over the 5-year post-burn period. Fool's huckleberry had dominated at 90% coverage prior to the fire. Also noticed in the fifth year were numerous spruce seedlings (5% cover) and a dramatic increase by liverworts and mosses.

The subalpine fir on the site were killed by the fire (either by bark charring or heat from the flames). Douglas-fir and grand fir seedlings were also entering the site in the fifth year as fire seral opportunists. Other invaders taking advantage from the loss of fool's huckleberry were Scouler willow, gooseberries, fireweed, pearly everlasting, bedstraw, skunk-leaved polemonium, and sedges.

### Summary

The regime for these cold, moist environments is for long return intervals between fires with stand replacement burning. However, fires burning in these environments often underburn owing to the higher humidities diurnally resulting in partial burns with varying intensities. Fire spread is often by spotting, which can result in a mosaic pattern rather than the continuous consumption of a ground-spreading fire. Subalpine fir is almost always killed along with Engelmann spruce owing to their very thin bark and shallow root systems. Fool's huckleberry is generally considered to be an endurer, and future sampling in the 10th year should support its steady return to site dominance.

**Subalpine fir/fool's huckleberry plant association (ABLA2/MEFE) (n=4)**

| Burn Intensity | ---Severe--- (n=2) | | ----Partial---- (n=2) | | |
|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **PRE (n=2)** | **1 (n=2)** | **5 (n=1)** |
| Trees | | | | | |
| subalpine fir (ABLA2) | ✳28 ◆(20-35) | 0 | 15 (15-15) | 0 | 0 |
| Engelmann spruce (PIEN) | 33 (20-46) | 0 | 23 (7-40) | 4 (0-7) | 5 |
| lodgepole pine (PICO) | 5 (0-10) | 0 | 20 (15-25) | 5 (0-10) | 8 |
| Douglas-fir (PSME) | 0 | 0 | 7 (0-15) | 4 (0-8) | 5 |
| Shrubs | | | | | |
| fool's huckleberry (MEFE) | 63 (60-65) | 1 (1-1) | 85 (80-90) | 15 (5-25) | 20 |
| Scouler willow (SASC) | 0 | 0 | 0 | 0 | 20 |
| gooseberries (RIBES) | 0 | t (t-t) | 0 | 0 | 25 |
| big huckleberry (VAME) | 1 (t-1) | 0 | 5 (t-10) | 3 (3-3) | 10 |
| grouse huckleberry (VASC) | 3 (t-5) | 0 | t (0-t) | t (0-t) | 0 |
| Perennial Forbs | | | | | |
| heartleaf arnica (ARCO) | 1 (0-1) | 3 (t-5) | 0 | 0 | 20 |
| beargrass (XETE) | 8 (0-15) | 8 (0-15) | 0 | 0 | 0 |
| pearly everlasting (ANMA) | 0 | 0 | 0 | 0 | 15 |
| skunk-leaved polemonium (POPU) | 0 | t (0-t) | 0 | 0 | 5 |
| Annual Forbs | | | | | |
| fireweed (EPAN) | 0 | 3 (1-5) | 0 | 0 | 45 |
| cleavers (GAAP) | 0 | 0 | 0 | 0 | 5 |
| Litter | 40 (20-60) | 68 (60-75) | 32 (25-40) | 63 (25-40) | 60 |
| Bare Ground | t (0-t) | 13 (5-20) | 0 | 10 (5-15) | 1 |
| Moss | 55 (40-70) | 15 (10-20) | 55 (50-60) | 18 (5-30) | 75 |
| Lichen | 3 (t-5) | 1 (t-1) | 8 (0-15) | 0 | 0 |

✳ Average Cover (%)
◆ Range of Cover (%)

**ABLA2/MEFE**

**Plot 7001** **Established - 1983** **Burned severely - 1994** Rapid River Fire

**Bridge Creek, Hells Canyon NRA (Idaho), Wallowa-Whitman National Forest**

**September 1984 – The pre-burn community was dominated by fool's huckleberry (60%). An herbaceous component was beargrass (15%). The forest overstory was comprised of Engelmann spruce (20%), lodgepole pine (10%), and subalpine fir (5%). Subalpine fir was the only tree species in the understory (15%).**

**September 1994 – Ten years later, the site burned severely with total tree mortality. Shrubs were moderately burned with stems blackened.**

**August 1995 – The first year after the fire, fool's huckleberry sprouted from shrub bases. Beargrass also resprouted with coverage equalling its pre-burn abundance (15%). Heartleaf arnica and fireweed occurred at 5% cover each. No tree species had yet re-established.**

## Subalpine fir/grouse huckleberry plant association (ABLA2/VASC)

Ten plots were used from 4 burns (Summit and Canal Burns in Oregon in 1989, Rapid River in Idaho and Twin Lakes in Oregon in 1994). The Summit and Canal Burn plots were resampled in years 1 and 5; the Rapid River and Twin Lakes plots were resampled the 1st year after the fires. Two of the plots burned with moderate intensity while the other 8 plots were severely burned. Most sites were on gentle slopes (10% or less), above 6300 ft elevation, and burned very intensively.

### Severe burn findings

The pre-burn forests were dominated by subalpine fir, Engelmann spruce, and lodgepole pine on the late- to mid-seral plots.

Subalpine fir dominated with overstory crown canopy cover exceeding 25%. Engelmann spruce was a co-dominant with canopy cover averaging 20%. Lodgepole pine was decadent with dominant tree cover averaging 8%. The tree understory was almost exclusively dominated by subalpine fir with average cover of 35%. Spruce also occupied the tree understory with subalpine fir at a low coverage of only 2%.

All trees were killed by stand-replacing fire. Lodgepole pine was re-entering the stands in the fifth year following the burns. Where stands were dominated on gentle flats by Engelmann spruce, the fires burned hottest with very little herbaceous or shrub vegetation present in the fifth year after the fire event. In these plots, bare ground dominated with vegetation comprising small coverages of mosses, liverworts, Ross' sedge, and fireweeds.

Shrubs present in minor amounts in the pre-burn plots and showing a dramatic increase in year 5 were grouse huckleberry and big huckleberry. The only shrub to invade was Scouler willow.

Herbaceous vegetation that demonstrated a marked increase between the first and fifth years after the burns in this plant association were arnica and Ross' sedge. Fireweeds and pearly everlasting were invaders. The fireweeds dramatically increased from 3% to 41% between the first and fifth years after the burns.

### Moderate burn findings

One plot was established in a mid-seral community before the fire. It consisted of a dominance by subalpine fir with lodgepole pine associated in the tree overstory. Poles, saplings, and seedlings were present with 20% cover by subalpine fir and spruce.

The other plot was in an early seral community where lodgepole pine dominated the tree overstory (cover = 55%). The only other trees on the plot were saplings and seedlings of subalpine fir and spruce.

All trees were killed by the charring and heat associated with the ground fire. The spruce, subalpine fir, and lodgepole pines in the burns did not survive. In the fifth year following the fires, lodgepole pine was the only tree species to occur on the site.

A dramatic fifth-year increase in shrub cover occurred with grouse huckleberry, gooseberries, and Utah honeysuckle. Scouler willow invaded but at much lower coverages than in the hotter burns.

In these moderately burned sites heartleaf arnica made a greater increase in occupancy than in the severely burned sites. Other herbs notably increasing in year 5 were: Ross' sedge, fireweeds, skunk-leaved polemonium, violets, and Sitka valerian. A notable comparison between these moderately burned sites with the intensively burned sites was that valerian and violets were not as affected by the burn on moderately burned plots and showed healthy increases. Valerian actually was shocked too greatly by the intensive burns and had not rebounded by the fifth year on those sites.

### Summary

These ridgetop subalpine fir-spruce dominated communities have a history of stand-replacement burning. Lodgepole pine is the seral tree species that dominates through mid-successional stages and modifies the harsh post-burn sites for emergence of the late-seral subalpine fir.

Grouse huckleberry is nicely adapted to the severity of the fire regimes and is a ready resprouter. It responds more vigorously on light to moderate burns. Opportunists enhancing the early seral composition of these communities are Utah honeysuckle and Scouler willow. Utah honeysuckle present in pre-burn communities was found to sprout on moderate burns.

Dragonhead (*Dracocephalum parviflorum*) entered one site aggressively in the first year after the burn (5%) and increased to 20% by the fifth year. Fire liverwort was often found occupying concavities where logs had burned and moisture collected enhancing its ability to survive on the exposed sites. It occupied from 1 to 5% of the sites.

**Subalpine fir/grouse huckleberry plant association (ABLA2/VASC) (n=10)**

| Burn Intensity | --------Severe-------- (n=8) | | | ---------Moderate-------- (n=2) | | |
|---|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** | **5** |
| Trees | | | | | | |
| subalpine fir (ABLA2) | **✳62** ◆(28-85) | **0** | **0** | 30 (10-50) | 0 | 0 |
| Engelmann spruce (PIEN) | **22** (0-46) | **0** | **0** | 8 (3-21) | 0 | 0 |
| lodgepole pine (PICO) | **18** (1-20) | **0** | **10** (3-35) | 38 (10-55) | 0 | 15 (10-20) |
| Shrubs | | | | | | |
| grouse huckleberry (VASC) | **10** (1-28) | **1** (0-3) | **12** (3-22) | 18 (1-35) | 6 (1-10) | 35 (10-60) |
| big huckleberry (VAME) | **1** (0-1) | **1** (0-1) | **5** (0-5) | 1 (0-1) | 1 (1-1) | 3 (0-5) |
| gooseberries (RIBES) | **1** (0-1) | **1** (0-1) | **2** (0-10) | 1 (0-1) | 1 (0-1) | 8 (0-15) |
| Utah honeysuckle (LOUT2) | **1** (0-1) | **1** (0-1) | **1** (0-1) | 2 (1-3) | 1 (1-1) | 13 (10-15) |
| Scouler willow (SASE) | **0** | **8** (0-15) | **9** (1-40) | 0 | 0 | 1 (0-1) |
| Sedges | | | | | | |
| Ross' sedge (CARO) | **1** (0-5) | **3** (1-10) | **10** (5-20) | 1 (0-1) | 1 (0-1) | 8 (0-15) |
| Perennial Forbs | | | | | | |
| heartleaf arnica (ARCO) | **7** (0-25) | **3** (0-10) | **7** (1-15) | 8 (5-10) | 18 (10-25) | 38 (20-55) |
| hawkweeds (HIAL, HIAL2) | **1** (0-1) | **1** (0-1) | **2** (0-3) | 1 (0-1) | 3 (1-5) | 3 (1-5) |
| skunk-leaved polemonium (POPU) | **2** (0-5) | **1** (0-1) | **2** (0-5) | 1 (0-1) | 1 (1-1) | 8 (5-10) |
| Sitka valerian (VASI) | **6** (0-10) | **1** (0-1) | **0** | 1 (0-1) | 1 (0-1) | 6 (1-10) |
| round leaved violet (VIOR2) | **2** (0-5) | **1** (0-3) | **2** (0-3) | 1 (1-1) | 1 (1-1) | 10 (10-10) |
| pearly everlasting (ANMA) | **0** | **0** | **6** (0-15) | 1 (0-1) | 0 | 2 (1-3) |
| fireweeds (EPILOB) | **0** | **3** (0-8) | **41** (1-90) | 1 (0-1) | 1 (1-1) | 38 (5-70) |
| Litter | **80** (35-95) | **50** (0-75) | **50** (0-85) | 35 (25-45) | 65 (45-85) | 83 (75-90) |
| Bare Ground | **1** (0-1) | **24** (0-80) | **14** (0-40) | 1 (1-1) | 5 (5-5) | 13 (5-20) |
| Mosses and Lichens | **17** (0-50) | **8** (0-20) | **13** (0-35) | 55 (50-60) | 13 (5-20) | 10 (5-15) |
| Liverworts | **0** | **1** (0-5) | **0** | 0 | 3 (3-3) | 0 |

✳ Average Cover (%)
◆ Range of Cover (%)

ABLA2/VASC

Plot 530 Established - 1980 Burned severely - 1989 Summit Fire

Catch One-Two Trail, Forks of Lightning Creek, Hells Canyon NRA,
Wallowa-Whitman National Forest

August 1981 – The forest overstory was composed of subalpine fir (30%), Engelmann spruce (20%), and lodgepole pine (1%). The trees in the understory were subalpine fir (35%) and Engelmann spruce (1%). Grouse huckleberry covered 24% of the site.

August 1989 – The fire killed all trees and burned standing vegetation to the ground surface. Lighter downed woody material was consumed.

August 1990 – Bare ground dominated the site (27%). Liverworts, fireweeds, heartleaf arnica, and grouse huckleberry were all present at low coverage.

July 1995 – The site, five years later, was totally dominated by fireweeds (19%), grouse huckleberry (18%), and lodgepole pine seedlings (3%). Other plants of note were heartleaf arnica and Ross' sedge at 5% cover each.

Eight plant community classification plots were used to study the fire effects in this plant association. These were located on the Summit and Canal Burns (1989) and Twin Lakes and Rapid River Burns (1994). Six plots burned severely while two plots were moderately burned. Slopes averaged 29% and ranged from 5% to 55%. Elevations ranged from 5620 ft to 6770 ft (mean= 6359 ft). Plots were located primarily in the northeast quadrant.

Severe Burn Findings

The six plots severely burned were different structurally and developmentally. Four plots were in late seral stands dominated by spruce. The other two plots were in early seral stands with domination by either Douglas-fir or lodgepole pine. In the late-seral stands, Engelmann spruce canopy cover in the overstory was 25% for dominant/codominant trees and 14% for intermediate/suppressed trees. Subalpine fir overstory cover was 10% for dominant/codominant trees and 4% for intermediate/ suppressed trees. Lodgepole pine was decadent as an overstory member at 11% cover. The tree understory was dominated by subalpine fir poles, saplings, and seedlings at an average of 8% cover.

All overstory trees were killed by stand-replacing fire. The understory trees were also killed by the severe burn. After 5 years the only tree regenerating on the sites was lodgepole pine (half of the sites with a cover of 10%). In one early-seral stand, dominated by lodgepole pine in the pre-burn community, lodgepole pine again dominated after 5 years (80% cover).

Decreasing following the burn were prince's pine and Utah honeysuckle. Increasing after 5 years was big huckleberry after an initial decline found in the first-year sampling. In the early seral plot dominated by lodgepole pine, a 5-fold increase by spiraea and grouse huckleberry resulted from the fire. Plants entering the post-burn community in the fifth year, which were not part of the pre-burn plant community, were Scouler willow, sticky currant, and swamp gooseberry.

Decreasing in the intense burns was sidebells pyrola while increasers were heartleaf arnica and Ross' sedge. Fireweeds, which had entered the burn area in the first year, had increased on all sites by the fifth year. Pearly everlasting was not found in the first year after the burn but was present in four of the six intensely burned sites in the fifth year sample. Long stalked clover was prominent (35% cover) in the fifth year sampling of the early seral lodgepole pine-dominated plot.

Bare ground increased dramatically on the intense burn sites (0% in pre-burn; 21% in first-year post-burn samples; 13% in fifth-year samples). Litter cover consequently declined from 92% in pre-burn communities sampled: 66% in the first year after the burn, 63% in the fifth year following the burn. Mosses dramatically increased following the burn (4% pre-burn; 6% first year after the burn; and 18% in the fifth year following the burn). Fire liverworts entered the sites on intensely burned areas increasing from 1 to 5%.

Moderate burn findings

The 2 plots used have only been sampled for first-year post-burn results to date. The stands were both late seral communities dominated by subalpine fir and spruce. Subalpine fir dominated the tree overstory with an average of 17% canopy cover in dominant/codominant and intermediate/suppressed layers. Engelmann spruce provided an average overstory crown cover of 6%. Understory trees were few with subalpine saplings/seedlings prominent at 5% cover. The spruce were all killed and most of the subalpine fir succumbed.

In this moderate burn, big huckleberry declined from 58% to 18% cover. Other shrubs declining were prince's pine, Utah honeysuckle and grouse huckleberry. Among the herbaceous vegetation, sidebells pyrola decreased; heartleaf arnica and round-leaved violet remained constant; and Sitka valerain increased.

Predictably bare ground increased from 0% to 9% in the first year with a concurrent decline in litter cover from 90% to 75%. Mosses doubled in coverage from 6% to 12%.

Summary

These mountain slope subalpine fir - spruce dominated communities are often replaced by fire when it occurs. Lodgepole pine is the fire seral species most often capitalizing on the stand-replacing event. Under fire regimes where fire can perform within its regular interval, these communities have been the recipients of cooler underburns. Wider spacing of overstory trees with less ingrowth by understory saplings and pole-sized material has historically resulted in less stand replacement burning of these north-aspect, higher elevation communities. Big huckleberry was killed by duff-consuming intense burns, however it readily sprouted and vigorously returned where burning was light to moderate. Opportunists with the stand replacement event were Scouler willow, fireweeds, and pearly everlasting. These can form dense patches and add diversity to the coniferous forest landscape.

**Subalpine fir/big huckleberry plant association (ABLA2/VAME) (n=8)**

| Burn Intensity | ---Severe--- (n=6) | | | ---Moderate--- (n=2) | |
|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** |
| Trees | | | | | |
| subalpine fir (ABLA2) | ***22** ◆(10-35) | **0** | **0** | **40** (40-41) | 8 (0-16) |
| Engelmann spruce (PIEN) | **24** (3-40) | **0** | **0** | **5** (4-6) | **0** |
| lodgepole pine (PICO) | **7** (0-40) | **0** | **32** (3-80) | **0** | **0** |
| Douglas-fir (PSME) | **7** (0-40) | **0** | **0** | **5** (0-10) | **0** |
| Shrubs | | | | | |
| big huckleberry (VAME) | **17** (1-45) | **2** (0-5) | **13** (10-15) | **58** (40-75) | **18** (15-20) |
| grouse huckleberry (VASC) | **7** (0-8) | **1** (0-1) | **12** (0-35) | **8** (1-15) | **3** (0-5) |
| birchleaf spiraea (SPBE) | **t** (0-1) | **1** (0-5) | **4** (0-15) | **0** | **0** |
| Utah honeysuckle (LOUT2) | **1** (1-1) | **t** (0-1) | **1** (0-3) | **3** (1-5) | **1** (0-1) |
| prince's pine (CHUM) | **3** (0-10) | **0** | **0** | **2** (0-3) | **1** (0-1) |
| Scouler willow (SASC) | **0** | **7** (0-45) | **8** (0-10) | **0** | **0** |
| sticky current (RIVI) | **t** (0-1) | **t** (0-1) | **9** (0-15) | **0** | **0** |
| swamp gooseberry (RILA) | **t** (0-1) | **1** (0-1) | **3** (0-3) | **0** | **0** |
| Sedges | | | | | |
| Ross' sedge (CARO) | **t** (0-1) | **1** (0-1) | **3** (0-5) | **1** (0-1) | **1** (1-1) |
| Perennial Forbs | | | | | |
| sidebells pyrola (PYSE) | **3** (0-5) | **t** (0-1) | **0** | **3** (1-5) | **1** (1-1) |
| heartleaf arnica (ARCO) | **9** (0-15) | **5** (0-20) | **14** (0-30) | **1** (1-1) | **1** (1-1) |
| pearly everlasting (ANMA) | **0** | **0** | **5** (0-10) | **0** | **0** |
| round-leaved violet (VIOR2) | **6** (0-16) | **t** (0-5) | **t** (0-5) | **3** (0-5) | **3** (0-5) |
| Sitka valerian (VASI) | **t** (0-1) | **0** | **0** | **1** (1-1) | **3** (3-3) |
| fireweeds (EPILO) | **0** | **1** (0-1) | **23** (5-50) | **0** | **t** (0-1) |
| Litter | **92** (84-95) | **66** (45-85) | **63** (20-85) | **90** (85-95) | **75** (65-85) |
| Bare Ground | **0** | **21** (1-40) | **13** (4-40) | **t** (0-1) | 8 (0-15) |
| Moss | **4** (1-15) | **6** (1-15) | **18** (10-35) | **6** (3-10) | **12** (10-15) |

* Average Cover (%)
◆ Range of Cover (%)

ABLA2/VAME
Plot 534 Established - 1980 Burned severely - 1989 Summit Fire
Summit Ridge, Hells Canyon NRA, Wallowa-Whitman National Forest

September 1980 –The pre-burn forest overstory was dominated by subalpine fir (30%) and Engelmann spruce (15%). Subalpine fir was the dominant tree in the understory (5%). Big huckleberry was the dominant shrub (19%) with grouse huckleberry associated (8%). The most common forb was heartleaf arnica (2%).

August 1989 – All trees were killed, shrubs burned to the ground surface, and lighter down woody material was consumed by the fire.

August 1990 – The first growing season after the fire, bare ground was prevalent (28%). Shrubs (big huckleberry, grouse huckleberry) and herbaceous plants (heartleaf arnica, Ross' sedge, and fireweeds) were all present at only 1% cover each.

July 1995 – Five years after the fire, the dominant plant was fireweed (23%). Rapidly increasing were big huckleberry (13%), heartleaf arnica (8%), and Ross' sedge (5%). Lodgepole pine was now establishing as the pioneering tree species (3%).

Two plots were used from two different burns (Teepee Butte 1988; Twin Lakes 1994). The Teepee Butte plot was burned severely and was sampled the first and fifth years after the fire. The Twin Lakes plot was moderately burned and was resampled the first year following the fire. Both plots had northerly aspects and were located on gentle slopes (5% and 12%) adjacent to riparian vegetation at canyon bottom sites.

Severe burn findings

The severe-burn plot was at an early-mid seral stage of development. Larch dominated the overstory (10% cover) with spruce (20% cover). Both spruce and subalpine fir poles, saplings, and seedlings constituted the tree understory (combined cover of 25%).

All trees were killed by stand-replacing fire. In the fifth year sample, lodgepole pine was occupying 80% of the site. It had been a prominent tree understory component in the pre-burn community at 40%.

Big huckleberry had been present at 30% cover, was eliminated by the fire, and returned by the fifth year with 5% cover. Twinflower was eliminated by the burn. Actively entering the plot following the intense burn were black elderberry and Scouler willow (both present at 10% cover in the fifth year after the burn.

Herbaceous vegetation declining with the burn in the first-year sample were goldthread, round-leaved violet, meadowrue, heartleaf arnica and beadlily. By the fifth year heartleaf arnica had doubled its coverage to 80%; beadlily had rebounded with 20% coverage; and meadowrue was present at 5% cover.

Plants entering the community as a result of the fire were fireweeds, clover, and pearly everlasting. Pearly everlasting was not present until the fifth year sample. No species increased as a result of the fire.

Litter cover declined, bare ground increased, and mosses declined from the burn.

Moderate burn findings

The moderately burned plot was in a spruce-dominated stand. The tree canopy cover was dominated by spruce with 75% cover. Subalpine fir was the only other tree species of note with its only presence in saplings and seedlings at 10% cover. All trees were killed by the burn.

Big huckleberry was prominent at 20% cover in the pre-burn plot but was absent in the first-year resample following the burn. Shrubs entering as a result of the burn were Scouler willow and black elderberry.

Herbaceous vegetation declining were meadowrue, heartleaf arnica, and beadlily. Beadlily and meadowrue were not found in the first-year resample after the burn. Increasing were Columbia brome and heartleaf arnica. An invader to the site after the fire was stinging nettle (5% cover).

Litter and bare ground coverages did not appreciably change. Mosses and lichens declined as a group.

Summary

These cold-air ponding sites are especially supportive of lodgepole pine when the late- and mid-seral communities are modified by stand-replacement burns. Black elderberry and Scouler willow provide enhancement to the coniferous forest by enriching the community with a hardwood component and a different structure to the forest understory. Columbia brome is stimulated by moderate and lighter burning in this plant association.

**Subalpine fir/beadlily plant association (ABLA2/CLUN) (n=2)**

| Burn Intensity | ----Severe---- (n=1) | | | ---Moderate--- (n=1) | |
|---|---|---|---|---|---|
| **Species** | **PRE** | **1** | **5** | **PRE** | **1** |
| Trees | | | | | |
| subalpine fir (ABLA2) | *10 | 0 | 0 | 10 | 0 |
| Engelmann spruce (PIEN) | 35 | 0 | 0 | 75 | 0 |
| lodgepole pine (PICO) | 40 | 0 | 80 | 0 | 0 |
| Shrubs | | | | | |
| big huckleberry (VAME) | 30 | 0 | 5 | 20 | 0 |
| twinflower (LIBO2) | 5 | 0 | 0 | 0 | 0 |
| Scouler willow (SASC) | 0 | 10 | 10 | 0 | 15 |
| black elderberry (SARA) | 0 | 1 | 10 | 0 | 3 |
| swamp gooseberry (RILA) | 1 | 1 | 1 | 0 | 0 |
| Sedges/Grasses | | | | | |
| Columbia brome (BRVU) | 1 | 0 | 0 | 1 | 25 |
| Ross' sedge (CARO) | 5 | 10 | 3 | 0 | 1 |
| Perennial Forbs | | | | | |
| beadlily (CLUN) | 15 | 1 | 20 | 10 | 0 |
| meadowrue (THOC) | 10 | 1 | 5 | 3 | 0 |
| goldthread (COOC2) | 25 | 1 | 1 | 0 | 0 |
| round-leaved violet (VIOR2) | 10 | 5 | 0 | 15 | 20 |
| heartleaf arnica (ARCO) | 40 | 30 | 80 | 30 | 5 |
| pearly everlasting (ANMA) | 0 | 0 | 10 | 0 | 0 |
| Annual Forbs | | | | | |
| fireweeds (EPAN, EPPA) | 0 | 4 | 11 | 0 | 1 |
| Litter | 90 | 70 | 80 | 55 | 50 |
| Bare Ground | 0 | 1 | 15 | 1 | 1 |
| Moss | 15 | 15 | 5 | 40 | 15 |
| Lichen | 0 | 0 | 0 | 1 | 10 |

* Average Cover (%)

ABLA2/CLUN

Plot 311 Established - 1979 Burned severely - 1988 Teepee Butte Fire

Poison Point Creek, Hells Canyon NRA, Wallowa-Whitman National Forest

July 1979 – The forest overstory was dominated by Engelmann spruce (20%) and western larch (10%). The understory trees were lodgepole pine (40%), Engelmann spruce (15%), and subalpine fir (10%). Shrubs were dominated by big huckleberry (30%) and twin flower (5%). The herbaceous composition was rich with heartleaf arnica (40%), beadlily (15%), goldthread (25%), and meadowrue (10%).

October 1988 – All trees were killed by the severe burn. Shrubs were burned to the ground surface or resulted in charred, black stems without branches.

July 1995 - Five years after the fire, heartleaf arnica dominated (80%) with beadlily (20%), fireweeds (11%), clover (10%), and pearly everlasting (10%) associated in the herbaceous layer. Shrubs pioneering following the burn were Scouler willow (10%) and black elderberry (10%). Lodgepole pine seedlings carpeted the site.

## Subalpine fir/arrowleaf groundsel plant association (ABLA2/SETR)

A plot established to characterize this plant association was severely burned by the Rapid River Fire in 1994. The plot is located in the Seven Devils Mtns. at 7180 ft on a southeast aspect with a 15% slope. The data presented from this plot are from prior to the fire and the first year following the burn.

### Severe Burn Findings

Spruce dominated this plot with an overstory canopy cover of 45%. Subalpine fir and lodgepole pine were weakly present in the overstory at a combined 5%. Very little tree understory occurred beneath the dense spruce overstory. Total understory tree cover was 5%.

All trees (subalpine fir, Engelmann spruce) were killed by the fire. After 1 year no new trees had established.

Shrubs were weakly present in the late seral community preceding the fire. Only swamp currant was present the year after the burn. It was not present in the pre-burn community.

Herbaceous plants increased the year after the burn. Heartleaf arnica, roundleaf violet, and meadowrue all increased in cover. Entering the site as a new occupant was alpine fireweed. Arrowleaf groundsel occupied a portion of the plot that escaped the burn and did not lose or gain from the fire.

### Summary

The burned area where fire was intense was covered by heartleaf arnica and meadowrue. Bearberry honeysuckle was killed by the intense burn. However where it occurred and fire had burned moderately or lightly the shrub was found to resprout.

**Subalpine fir/arrowleaf groundsel plant association (ABLA2/SETR) (n=1)**

| Burn Intensity | -----Severe----- (n=1) | |
|---|---|---|
| **Species** | **PRE** | **1** |
| Trees | | |
| subalpine fir (ABLA2) | *7 | 0 |
| Engelmann spruce (PIEN) | 45 | 0 |
| Shrubs | | |
| Utah honeysuckle (LOUT2) | 1 | 0 |
| swamp gooseberry (RILA) | 0 | 1 |
| bearberry honeysuckle (LOIN) | 0 | 1 |
| Perennial Forbs | | |
| heartleaf arnica (ARCO) | 10 | 15 |
| meadowrue (THOC) | 1 | 10 |
| violets (VIOR2, VIGL) | 1 | 2 |
| arrowleaf groundsel (SETR) | 1 | 1 |
| alpine willowweed (EPAL) | 0 | 1 |
| monkshood (ACCO) | t | 5 |
| Litter | 95 | 95 |
| Bare Ground | 0 | 1 |
| Moss | 1 | 1 |
| Liverworts | 0 | 1 |

* Average Cover (%)

## Subalpine fir/false bugbane plant association (ABLA2/TRCA3)

One plot established to characterize this plant association was burned severely by the Twin Lakes Fire of 1994. It is located north of Twin Lakes below the rim overlooking the Imnaha River canyon. The plot is on a 10% slope at 5890 ft elevation and has a northeasterly aspect.

### Severe Burn Findings

The stand was dominated by Engelmann spruce with 40% canopy cover. Subalpine fir was present in trace coverage as an understory member where spruce dominated at only 3% cover. All the trees were killed by the fire.

Shrub coverage increased with the entry into the community by Scouler willow and black elderberry. Thimbleberry was unaffected by this burn.

In the first year after the burn herbaceous vegetation had declined from the fire. Declining were heartleaf arnica and false bugbane. Interestingly species that had increased in moderate burns of vegetation pertaining to plant associations with similar herbaceous composition in cool, moist subalpine fir forests were killed by this severe burn. These included Columbia brome, woods strawberry, meadowrue, and roundleaved violet.

Litter cover declined and bare ground increased. Mosses made a six-fold increase to 60% coverage of the site and fire liverworts entered after this fire with a cover of 5%.

### Summary

On that portion of the plot where fire burned hottest, fireweeds dominated. Fireweed (*Epilobium angustifolium*) and tall annual willowweed (*E. paniculatum*) occupied 18% of the plot. Scouler willow was present with black elderberry on the portion of the plot where fire had burned less severely. Fire liverworts and mosses occupied an impressive 65% of the ground surface on this intensely burned site. This was probably due to the vernally moist soils prevalent in the subalpine fir/false bugbane plant association.

**Subalpine fir/false bugbane plant association (ABLA2/TRCA3) (n=1)**

| Burn Intensity | -----Severe----- (n=1) | |
|---|---|---|
| **Species** | **PRE** | **1** |
| Trees | | |
| subalpine fir (ABLA2) | *1 | 0 |
| Engelmann spruce (PIEN) | 43 | 0 |
| Shrubs | | |
| thimbleberry (RUPA) | 1 | 1 |
| Scouler willow (SASC) | 0 | 10 |
| black elderberry (SARA) | 1 | 5 |
| Grasses/Sedges | | |
| Columbia brome (BRVU) | 10 | 0 |
| Ross' sedge (CARO) | 1 | 1 |
| Perennial Forbs | | |
| false bugbane (TRCA3) | 20 | 1 |
| heartleaf arnica (ARCO) | 30 | 1 |
| pearly everlasting (ANMA) | 1 | 1 |
| woods strawberry (FRVE) | 10 | 0 |
| meadowrue (THOC) | 15 | 0 |
| violets (VIOLA) | 15 | 0 |
| fireweed (EPAN) | 0 | 15 |
| Annual Forbs | | |
| tall annual willowweed (EPPA) | 0 | 3 |
| Litter | 85 | 20 |
| Bare Ground | 1 | 10 |
| Moss | 10 | 60 |
| Liverworts | 0 | 5 |

* Average Cover (%)

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# APPENDIX A. Species List (by Scientific Name)

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| **TREES** | | | |
| Abies grandis | Grand Fir | ABGR | ABGR |
| Abies lasiocarpa | Subalpine Fir | ABLA2 | ABLA |
| Larix occidentalis | Western Larch | LAOC | LAOC |
| Picea engelmannii | Engelmann Spruce | PIEN | PIEN |
| Pinus contorta | Lodgepole Pine | PICO | PICO |
| Pinus ponderosa | Ponderosa Pine | PIPO | PIPO |
| Pseudotsuga menziesii | Douglas Fir | PSME | PSME |
| **SHRUBS** | | | |
| Acer glabrum | Rocky Mountain Maple | ACGL | ACGL |
| Alnus sinuata | Sitka Alder | ALSI | ALSI3 |
| Alnus spp. | Alder | ALNUS | ALNUS |
| Amelanchier alnifolia | Western Serviceberry | AMAL | AMAL2 |
| Arctostaphylos nevadensis | Pinemat Manzanita | ARNE | ARNE |
| Arctostaphylos uva-ursi | Bearberry | ARUV | ARUV |
| Artemisia tridentata | Big Sagebrush | ARTR | ARTR2 |
| Artemisia tridentata vaseyana | Mountain Big Sagebrush | ARTRV | ARTRV |
| Berberis repens | Low Oregongrape | BERE | BERE |
| Berberis spp | Oregongrape | BERBE | BERBE |
| Ceanothus sanguineus | Redstem Ceanothus | CESA | CESA |
| Ceanothus spp. | Ceanothus | CEANO | CEANO |
| Ceanothus velutinus | Snowbrush Ceanothus/Buckbrush | CEVE | CEVE |
| Cercocarpus ledifolius | Curlleaf Mountain Mahogany | CELE | CELE3 |
| Chimaphila menziesii | Little Prince's Pine/Pipissewa | CHME | CHME |
| Chimaphila umbellata | Common Prince's Pine | CHUM | CHUM |
| Chrysothamnus nauseosus | Gray Rabbitbrush | CHNA | CHNA2 |
| Chrysothamnus viscidiflorus | Green Rabbitbrush | CHVI | CHVI8 |
| Holodiscus discolor | Creambush Oceanspray | HODI | HODI |
| Linnaea borealis | American Twinflower | LIBO2 | LIBO3 |
| Lonicera involucrata | Bearberry Honeysuckle/Black Twinberry | LOIN | LOINS |
| Lonicera utahensis | Utah Honeysuckle | LOUT2 | LOUT2 |
| Menziesia ferruginea | Fool's Huckleberry | MEFE | MEFE |
| Pachistima myrsinites | Oregon Boxwood | PAMY | PAMY |
| Philadelphus lewisii | Lewis Mockorange/Syringa | PHLE2 | PHLE4 |
| Physocarpus malvaceus | Mallow Ninebark | PHMA | PHMA5 |
| Potentilla fruitcosa | Bush/Shrubby Cinquefoil | POFR | POFR4 |
| Purshia tridentata | Antelope Bitterbrush | PUTR | PUTR2 |
| Rhus glabra | Smooth Sumac | RHGL | RHGL |
| Rhus radicans | Poison Ivy, Poison Oak | RHRA | RHRA6 |
| Ribes cereum | Wax or Squaw Currant | RICE | RICE |
| Ribes lacustre | Prickly Currant/Swamp Gooseberry | RILA | RILA |
| Ribes spp. | Currant or Gooseberry | RIBES | RIBES |
| Ribes viscosissimum | Sticky Currant | RIVI | RIVI3 |
| Rosa gymnocarpa | Baldhip Rose | ROGY | ROGY |
| Roas spp. | Rose | ROSA | ROSA5 |
| Rosa woodsii | Wood's Rose | ROWO | ROWO |
| Rubus idaeus | Red Raspberry | RUID | RUID |
| Rubus parviflorus | Western Thimbleberry | RUPA | RUPA |
| Salix bebbiana | Bebb Willow | SABE | SABE2 |
| Salix boothii | Booth Willow | SABO2 | SABO2 |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Salix scouleriana | Scouler Willow | SASC | SASC |
| Salix spp. | Willow | SALIX | SALIX |
| Sambucus cerulea | Blueberry Elder | SACE | SACE3 |
| Sambucus racemosa | Black Elderberry | SARA | SARA2 |
| Sambucus spp. | Elderberry | SAMBU | SAMBU |
| Shepherdia canadensis | Soapberry/Canada Buffaloberry | SHCA | SHCA |
| Sorbus scopulina | Cascade Mountain Ash | SOSC2 | SOSC2 |
| Spiraea betulifolia | Birch/Shiny Leaf Spiraea | SPBE | SPBE2 |
| Symphoricarpos albus | Common Snowberry | SYAL | SYAL |
| Symphoricarpos oreophilus | Mountain Snowberry | SYOR | SYOR2 |
| Symphoricarpos spp. | Snowberry | SYMPH | SYMPH |
| Tetradymia canescens | Gray Horsebrush | TECA | TECA2 |
| Vaccinium membranaceum | Big Huckleberry | VAME | VAME |
| Vaccinium scoparium | Grouse Huckleberry/Whortleberry | VASC | VASC |
| **FORBS** | | | |
| Achillea millefolium | Common Yarrow | ACMI | ACMI2 |
| Aconitum columbianum | Columbia Monkshood | ACCO | ACCO4 |
| Actaea rubra | Wild Red Baneberry | ACRU | ACRU2 |
| Adenocaulon bicolor | Trail/Pathfinder Plant | ADBI | ADBI |
| Agastache urticifolia | Nettleleaf Horsemint | AGUR | AGUR |
| Agoseris glauca | Pale Agoseris | AGGL | AGGL |
| Agoseris grandiflora | Large-flower Agoseris | AGGR | AGGR |
| Agoseris heterophylla | Annual Agoseris | AGHE | AGHE2 |
| Agoseris spp. | Agoseris | AGOSE | AGOSE |
| Allium acuminatum | Tapertip Onion | ALAC | ALAC4 |
| Allium spp. | Onion | ALLIU | ALLIU |
| Allium tolmiei | Tolmie's Onion | ALTO | ALTO |
| Allium tolmiei platyphyllum | Tolmie's Onion | ALTOP | ALTOP2 |
| Alyssum alyssoides | Pale Alyssum | ALAL | ALAL3 |
| Amaranthus spp. | Pigweed | AMARA | AMARA |
| Amsinckia retrorsa | Rigid Fiddleneck | AMRE2 | AMRE2 |
| Amsinckia spp. | Fiddleneck | AMSIN | AMSIN |
| Anaphalis margaritacea | Common Pearly-everlasting | ANMA | ANMA |
| Anchusa spp. | Bigloss | ANCHU | ANCHU |
| Anemone piperi | Windflower | ANPI | ANPI |
| Antennaria anaphaloides | Tall Pussytoes | ANAN | ANAN2 |
| Antennaria dimorpha | Low Pussytoes | ANDI | ANDI2 |
| Antennaria luzuloides | Woodrush Pussytoes | ANLU | ANLU2 |
| Antennaria microphylla | Rosy Pussytoes | ANMI2 | ANMI3 |
| Antennaria racemosa | Slender Pussytoes | ANRA | ANRA |
| Antennaria spp. | Pussytoes | ANTEN | ANTEN |
| Antennaria stenophylla | Narrow-leaf Pussytoes | ANST | ANST2 |
| Apocynum androsaemifolium | Spreading Dogbane | APAN | APAN2 |
| Apocynum androsaemifolium pumilum | Spreading Dogbane | APANP | APANP |
| Aquilegia formosa | Sitka/Red Columbine | AQFO | AQFO |
| Arabis hirsuta | Hairy Rockcress | ARHI | ARHI |
| Arabis hirsuta glabrata | Hairy Rockcress | ARHIG | ARHIG |
| Arabis holboellii | Holboell's Rockcress | ARHO | ARHO2 |
| Arabis lignifera | Woodybranch Rockcress | ARLI | ARLI |
| Arabis spp. | Rockcress | ARABI | ARABI2 |
| Arenaria congesta | Ballhead/Capitate Sandwort | ARCO2 | ARCO5 |
| Arenaria macrophylla | Bigleaf Sandwort | ARMA3 | ARMA18 |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Arenaria serpyllifolia | Thyme-leaf Sandwort | ARSE | ARSE2 |
| Arenaria spp. | Sandwort | ARENA | ARENA |
| Arnica cordifolia | Heartleaf Arnica | ARCO | ARCO9 |
| Arnica latifolia | Mountain Arnica | ARLA | ARLA8 |
| Arnica latifolia latifolia | Mountain Arnica | ARLAL | UNASSGND |
| Arnica sororia | Twin Arnica | ARSO | ARSO2 |
| Arnica spp. | Arnica | ARNIC | ARNIC |
| Artemisia ludoviciana | Western mugwort | ARLU | ARLU |
| Aster conspicuus | Showy Aster | ASCO | ASCO3 |
| Aster perelegans | Elegant Aster | ASPE | ASPE3 |
| Aster spp. | Aster | ASTER | ASTER |
| Astragalus canadensis | Canada Milkvetch | ASCA7 | ASCA11 |
| Astragalus cusickii | Cusick's Milkvetch | ASCU4 | ASCU5 |
| Astragalus inflexus | Hairy Milkvetch | ASIN2 | ASIN5 |
| Astragalus reventus sheldonii | Sheldon's Milkvetch | ASRES | ASRES |
| Astragalus spp. | Milkvetch | ASTRA | ASTRA |
| Avena fatua | Wild Oats | AVFA | AVFA |
| Balsamorhiza incana | Woolly Balsamroot | BAIN | BAIN |
| Balsamorhiza sagittata | Arrowleaf Balsamroot | BASA | BASA3 |
| Balsamorhiza serrata | Serrated Balsamroot | BASE | BASE2 |
| Besseya rubra | Red Kittentail/Red Besseya | BERU | BERU |
| Blepharipappus scaber | Blepharipappus | BLSC | BLSC |
| Borago spp. | Borage | BORAG | BORAG |
| Brodiaea douglasii | Douglas' Brodiaea | BRDO | BRDO |
| Calochortus elegans | Elegant Mariposa | CAEL | CAEL |
| Calochortus macrocarpus | Sagebrush Mariposa | CAMA | CAMA5 |
| Calochortus spp. | Mariposa or Sego Lily | CALOC | CALOC |
| Camassia quamash | Common Camas | CAQU | CAQU2 |
| Capsella bursa-pastoris | Shepherd's Purse | CABU | CABU2 |
| Castilleja applegatei | Wavy-leaved Paintbrush | CAAP2 | CAAP4 |
| Castilleja hispida | Harsh Paintbrush | CAHI2 | CAHI9 |
| Castilleja miniata | Scarlet Paintbrush | CAMI2 | CAMI12 |
| Castilleja spp. | Paintbrush | CASTI | CASTI2 |
| Cerastium arvense | Field Chickweed | CEAR | CEAR4 |
| Cerastium spp. | Chickweed | CERAS | CERAS |
| Cerastium viscosum | Sticky Chickweed | CEVI | CEVI3 |
| Cerastium vulgatum | Big Chickweed | CEVU | CEVU |
| Chenopodium fremontii | Fremont's Lamb's Quarters | CHFR | CHFR3 |
| Chrysopsis villosa | Hairy Golden Aster | CHVI2 | CHVI10 |
| Circaea alpina | Enchanter's Nightshade | CIAL | CIAL |
| Cirsium arvense | Canada Thistle | CIAR | CIAR4 |
| Cirsium spp. | Thistle | CIRSI | CIRSI |
| Cirsium vulgare | Bull/Common Thistle | CIVU | CIVU |
| Clarkia pulchella | Deerhorn/Pink Fairies | CLPU | CLPU |
| Clarkia rhomboidea | Common Clarkia | CLRH | CLRH |
| Clintonia uniflora | Queen's Cup Beadlily | CLUN | CLUN2 |
| Collinsia grandiflora | Large-flowered Collinsia | COGR | COGR2 |
| Collinsia parviflora | Small-flowered Blue-eyed Mary | COPA | COPA3 |
| Collomia grandiflora | Large-flowered Collomia | COGR2 | COGR4 |
| Collomia linearis | Narrow-leaf Collomia | COLI2 | COLI2 |
| Collomia spp. | Collomia | COLLO | COLLO |
| Conyza canadensis | Horseweed | COCA2 | COCA5 |
| Conyza canadensis glabrata | Horseweed | COCAG | COCAG |
| Conyza spp. | Horseweed | CONYZ | CONYZ |
| Coptis occidentalis | Western Goldthread | COOC2 | COOC |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Corallorhiza maculata | Spotted Coral Root | COMA3 | COMA4 |
| Crepis acuminata | Long-leaved/Tapertip Hawksbeard | CRAC | CRAC2 |
| Crepis atrabarba | Slender Hawksbeard | CRAT | CRAT |
| Crepis spp. | Hawksbeard | CREPI | CREPI |
| Cryptantha affinis | Slender Cryptantha | CRAF | CRAF |
| Cryptantha flaccida | Weak-stemmed Cryptantha | CRFL | CRFL4 |
| Cryptantha intermedia | Common Cryptantha | CRIN2 | CRIN8 |
| Cryptantha interrupta | Bristly Cryptantha | CRIN3 | CRIN9 |
| Cryptantha simulans | Pinewoods Cryptantha | CRSI | CRSI2 |
| Cryptantha torreyana | Torrey's Cryptantha | CRTO | CRTO4 |
| Cymopterus terebinthinus foeniculaceus | Turpentine Cymopterus | CYTEF | CYTEF |
| Cynoglossum occidentale | Western Houndstongue | CYOC | CYOC |
| Cynoglossum officinale | Common Houndstongue | CYOF | CYOF |
| Cystopteris fragilis | Brittle Bladderfern | CYFR | CYFR2 |
| Delphinium bicolor | Little Larkspur | DEBI | DEBI |
| Delphinium depauperatum | Slim/Dwarf Larkspur | DEDE | DEDE2 |
| Delphinium nuttallianum | Upland Larkspur | DENU3 | DENU2 |
| Delphinium spp. | Larkspur | DELPH | DELPH |
| Descurainia pinnata | Pinnate Tansymustard | DEPI | DEPI |
| Descurainia richardsonii | Mountain Tansymustard | DERI | DERI2 |
| Descurainia richardsonii sonnei | Mountain Tansymustard | DERIS | DERIS |
| Disporum trachycarpum | Wartberry Fairybells | DITR | DITR2 |
| Dodecatheon spp. | Shooting-star | DODEC | DODEC |
| Draba verna | Spring Whitlow-grass | DRVE2 | DRVE2 |
| Dracocephalum parviflorum | Dragonhead | DRPA | DRPA2 |
| Epilobium alpinum | Alpine Willow-weed | EPAL | EPAL |
| Epilobium angustifolium | Fireweed | EPAN | EPAN2 |
| Epilobium glaberrimum | Smooth Willow-weed | EPGL | EPGL |
| Epilobium glaberrimum fastigiatum | Smooth Willow-weed | EPGLF | EPGLF2 |
| Epilobium glandulosum | Common Willow-weed | EPGL2 | EPGL4 |
| Epilobium minutum | Small-fld Willow-weed | EPMI | EPMI |
| Epilobium paniculatum | Tall Annual Willow-weed | EPPA | EPPA2 |
| Epilobium spp. | Willow-weed | EPILO | EPILO |
| Epilobium watsonii | Watson's Willow-weed | EPWA | EPWA3 |
| Epilobium watsonii occidentale | Watson's Willow-weed | EPWAO | EPWAO2 |
| Erigeron chrysopsidis | Dwarf Yellow Fleabane | ERCH | ERCH4 |
| Erigeron filifolius | Threadleaf Fleabane | ERFI | ERFI2 |
| Erigeron inornatus | Rayless Daisy | ERIN2 | ERIN2 |
| Erigeron peregrinus | Subalpine Daisy | ERPE | ERPE3 |
| Erigeron pumilus | Shaggy Fleabane | ERPU | ERPU2 |
| Erigeron speciosus | Showy Fleabane | ERSP | ERSP4 |
| Erigeron spp. | Daisy or Fleabane | ERIGE | ERIGE2 |
| Eriogonum compositum | Northern Buckwheat | ERCO5 | ERCO12 |
| Eriogonum cusickii | Cusick's Buckwheat | ERCU | ERCU3 |
| Eriogonum flavum | Golden Buckwheat | ERFL | ERFL4 |
| Eriogonum heracleoides | Wyeth's Creamy Buckwheat | ERHE | ERHE2 |
| Eriogonum spp. | Buckwheat | ERIOG | ERIOG |
| Eriophyllum lanatum | Common Eriophyllum/Woolly Sunflower | ERLA | ERLA6 |
| Erodium cicutarium | Stork's Bill/Filaree | ERCI | ERCI6 |
| Filago arvensis | Field Filago | FIAR | FIAR2 |
| Fragaria spp. | Strawberry | FRAGA | FRAGA |
| Fragaria vesca | Woods Strawberry | FRVE | FRVE |
| Fragaria virginiana | Blueleaf/Broadpetal Strawberry | FRVI | FRVI |
| Frasera albicaulis | White-stemmed frasera | FRAL2 | FRAL2 |
| Frasera spp. | Frasera | FRASE | FRASE |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Fritillaria pudica | Yellow Bells | FRPU | FRPU2 |
| Galium aparine | Catchweed Bedstraw/Cleavers | GAAP | GAAP2 |
| Galium asperrimum | Rough Bedstraw | GAAS | GAAS3 |
| Galium boreale | Northern Bedstraw | GABO | GABO2 |
| Galium parisiense | Wall Bedstraw | GAPA2 | GAPA5 |
| Galium spp. | Bedstraw | GALIU | GALIU |
| Galium triflorum | Sweetscented Bedstraw | GATR | GATR3 |
| Gayophytum diffusum | Spreading Groundsmoke | GADI | GADI2 |
| Geranium bicknellii | Bicknell's Geranium | GEBI | GEBI2 |
| Geranium molle | Dovefoot Geranium | GEMO | GEMO |
| Geranium pusillum | Small-flowered Geranium | GEPU | GEPU2 |
| Geranium viscosissimum | Sticky Geranium | GEVI | GEVI2 |
| Geum macrophyllum | Largeleaf Avens | GEMA | GEMA4 |
| Geum spp. | Avens | GEUM | GEUM |
| Geum triflorum | Red Avens/Old Man's Whiskers | GETR | GETR |
| Geum triflorum campanulatum | Red Avens/Old Man's Whiskers | GETRC | GETRC |
| Geum triflorum triflorum | Red Avens/Old Man's Whiskers | GETRT | GETRT |
| Gnaphalium chilense | Cotton-batting Plant | GNCH | GNCH |
| Gnaphalium microcephalum | Slender Cudweed | GNMI | GNMI |
| Gnaphalium palustre | Lowland Cudweed | GNPA | GNPA |
| Gnaphalium spp. | Cudweed | GNAPH | GNAPH |
| Goodyera oblongifolia | Rattlesnake-plantain | GOOB | GOOB2 |
| Grindelia nana | Low Gumweed | GRNA | GRNA |
| Gymnocarpium dryopteris | Oak Fern | GYDR | GYDR |
| Gymnosteris parvula | Small-flowered Gymnosteris | GYPA2 | GYPA2 |
| Haplopappus carthamoides | Large-flowered Goldenweed | HACA | HACA5 |
| Heracleum lanatum | Common Cowparsnip | HELA | HELA4 |
| Heuchera cylindrica | Roundleaf Lava Alumroot | HECY | HECY2 |
| Heuchera grossulariifolia | Gooseberry-leaved Alumroot | HEGR | HEGR8 |
| Heuchera grossulariifolia tenuifolia | Gooseberry-leaved Alumroot | HEGRT | HEGRT |
| Heuchera spp. | Alumroot | HEUCH | HEUCH |
| Hieracium albertinum | Western Hawkweed | HIAL2 | HIAL |
| Hieracium albiflorum | White Hawkweed | HIAL | HIAL2 |
| Hieracium cynoglossoides | Houndstongue Hawkweed | HICY | HICY |
| Hieracium scouleri | Woolly Weed | HISC | HISC2 |
| Hieracium spp. | Hawkweed | HIERA | HIERA |
| Hydrophyllum capitatum | Ballhead Waterleaf/Woolly Breeches | HYCA | HYCA4 |
| Hypericum perforatum | Klamathweed, Common St. John's Wort | HYPE | HYPE |
| Hypericum spp. | St. John's Wort | HYPER | HYPER |
| Iliamna rivularis | Streambank Globemallow | ILRI | ILRI |
| Lactuca serriola | Prickly Lettuce | LASE | LASE |
| Lactuca spp. | Lettuce | LACTU | LACTU |
| Lathyrus nevadensis cusickii | Cusick's Peavine | LANEC | LANEC |
| Lathyrus pauciflorus | Few-flowered Peavine | LAPA2 | LAPA5 |
| Lepidium densiflorum | Prairie Pepperweed | LEDE | LEDE |
| Lepidium ramosissimum | Branded Peppergrass | LERA | LERA2 |
| Lepidium spp. | Pepperweed, Peppergrass | LEPID | LEPID |
| Ligusticum grayi | Gray's Licoriceroot/Lovage | LIGR | LIGR |
| Ligusticum spp. | Licoriceroot/Lovage | LIGUS | LIGUS |
| Linanthus harknessii | Harkness' Linanthus | LIHA | LIHA |
| Linaria dalmatica | Bastard Toadflax | LIDA | LIDA |
| Linum perenne | Blue Flax | LIPE | LIPE2 |
| Listera caurina | Western Twayblade | LICA3 | LICA10 |
| Listera convallarioides | Broad-lipped Twayblade | LICO2 | LICO5 |
| Listera spp. | Twayblade | LISTE | LISTE |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Lithophragma bulbifera | Bulbiferous Fringecup | LIBU | LIBU2 |
| Lithophragma parviflora | Small-flowered Fringecup | LIPA | LIPA5 |
| Lithophragma spp. | Fringecup | LITHO | LITHO2 |
| Lithospermum arvense | Corn Gromwell | LIAR | LIAR4 |
| Lithospermum ruderale | Wayside Gromwell | LIRU | LIRU4 |
| Lomatium ambiguum | Swaledesert Parsley | LOAM | LOAM |
| Lomatium cous | Cous Biscuitroot | LOCO2 | LOCO4 |
| Lomatium dissectum | Fernleaved Desert Parsley | LODI2 | LODI |
| Lomatium dissectum eatonii | Fernleaved Desert Parsley | LODIE | LODIE |
| Lomatium leptocarpum | Slenderfruit/Bicolor Biscuitroot | LOLE | LOLE2 |
| Lomatium macrocarpum | Big Seed Biscuitroot | LOMA | LOMA3 |
| Lomatium spp. | Biscuitroot/Desert Parsley | LOMAT | LOMAT |
| Lomatium triternatum | Nineleaf Desert Parsley | LOTR | LOTR2 |
| Lomatium triternatum platycarpum | Nineleaf Desert Parsley | LOTRP | LOTRP |
| Lupinus caudatus | Tailcup Lupine | LUCA | LUCA |
| Lupinus laxiflorus | Spurred Lupine | LULA2 | LULA3 |
| Lupinus leucophyllus tenuispicus | Woolly Lupine | LULET | LULET |
| Lupinus sericeus | Silky Lupine | LUSE | LUSE4 |
| Lupinus sericeus sericeus | Silky Lupine | LUSES | LUSES2 |
| Lupinus spp. | Lupine | LUPIN | LUPIN |
| Machaeranthera shastensis | Shasta Aster | MASH | MASH |
| Madia citriodora | Lemon Tarweed | MACI | MACI2 |
| Madia glomerata | Cluster Tarweed | MAGL | MAGL2 |
| Madia gracilis | Common/Slender Tarweed | MAGR | MAGR3 |
| Madia spp. | Tarweed | MADIA | MADIA |
| Medicago lupulina | Black Medic | MELU | MELU |
| Melilotus alba | White Sweetclover | MEAL | MEAL12 |
| Melilotus officinalis | Yellow Sweetclover | MEOF | MEOF |
| Melilotus spp. | Sweetclover | MELIL | MELIL |
| Mentzelia dispersa | Bushy Mentzelia | MEDI | MEDI |
| Mertensia ciliata | Broad-leaf Bluebells | MECI | MECI3 |
| Mertensia paniculata | Tall bluebells | MEPA | MEPA |
| Mertensia spp. | Bluebells | MERTE | MERTE |
| Microseris nutans | Nodding Microseris | MINU | MINU |
| Microseris troximoides | False Agoseris | MITR | MITR5 |
| Microsteris gracilis | Pink Microsteris | MIGR | MIGR |
| Mimulus moschatus | Musk Monkeyflower | MIMO | MIMO3 |
| Mimulus nanus | Dwarf Monkeyflower | MINA | MINA |
| Mimulus spp. | Monkey-flower | MIMUL | MIMUL |
| Mitella spp. | Mitrewort | MITEL | MITEL |
| Mitella stauropetala | Side-flowered Mitrewort | MIST2 | MIST3 |
| Mitella trifida | Three-toothed Mitrewort | MITR2 | MITR4 |
| Montia perfoliata | Miner's Lettuce | MOPE | MOPE3 |
| Myosotis micrantha | Blue Scorpion-grass | MYMI | MYMI |
| Myosotis scorpioides | Common Forget-me-not | MYSC | MYSC |
| Myosotis spp. | Forget-me-not | MYOSO | MYOSO |
| Navarretia intertexta | Pincushion Plant | NAIN | NAIN2 |
| Oenothera heterantha | Longleaf Evening Primrose | OEHE | OEHE |
| Oenothera hookeri | Hooker Evening Primrose | OEHO | OEHO |
| Opuntia polycantha | Prickly Pear Cactus | OPPO | OPPO |
| Orthocarpus hispidus | Hairy Owl Clover | ORHI | ORHI |
| Orthocarpus tenuifolius | Thin-leaved Owl Clover | ORTE | ORTE2 |
| Osmorhiza chilensis | Mountain Sweet-cicely | OSCH | OSCH |
| Osmorhiza occidentalis | Western Sweet-cicely | OSOC | OSOC |
| Pedicularis bracteosa | Bracted Lousewort | PEBR | PEBR |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Pedicularis racemosa | Leafy/Sickletop Lousewort | PERA | PERA |
| Penstemon deustus | Hot Rock/Scabland Penstemon | PEDE | PEDE4 |
| Penstemon fruticosus | Shrub Penstemon | PEFR3 | PEFR3 |
| Penstemon globosus | Globe Penstemon | PEGL4 | PEGL5 |
| Penstemon rydbergii | Rydberg's Penstemon | PERY | PERY |
| Penstemon spp. | Penstemon | PENST | PENST |
| Penstemon wilcoxii | Wilcox's Penstemon | PEWI | PEWI |
| Perideridia bolanderi | Bolander's Yampah | PEBO | PEBO2 |
| Perideridia gairdneri | Gairdner's Yampah | PEGA2 | PEGA3 |
| Perideridia spp. | Yampah | PERID | PERID |
| Phacelia hastata | Silverleaf Phacelia | PHHA | PHHA |
| Phacelia hastata leucophylla | Silverleaf Phacelia | PHHAL | PHHAL |
| Phacelia heterophylla | Varileaf Phacelia | PHHE | PHHE2 |
| Phacelia linearis | Threadleaf Phacelia | PHLI | PHLI |
| Phacelia spp. | Phacelia | PHACE | PHACE |
| Phlox caespitosa | Tufted Phlox | PHCA2 | PHCA7 |
| Phlox colubria | Snake River Phlox | PHCO2 | PHCO10 |
| Phlox longifolia | Long-leaved Phlox | PHLO | PHLO2 |
| Phlox pulvinata | Cushion Phlox | PHPU | PHPU5 |
| Phlox spp. | Phlox | PHLOX | PHLOX |
| Phlox viscida | Sticky Phlox | PHVI3 | PHVI3 |
| Physalis longifolia | Long-leaved Ground Cherry | PHLO2 | PHLO4 |
| Physaria oregana | Oregon Twinpod | PHOR | PHOR2 |
| Plantago elongata | Slender Plantain | PLEL | PLEL |
| Plantago patagonica | Indian Wheat | PLPA | PLPA2 |
| Plectritis macrocera | Longhorn Plectritis | PLMA3 | PLMA4 |
| Polemonium pulcherrimum | Skunkleaved Polemonium/Jacob's Ladder | POPU | POPU3 |
| Polygonum douglasii | Douglas' Knotweed | PODO | PODO4 |
| Polygonum majus | Wiry/Palouse Knotweed | POMA2 | POMA9 |
| Polygonum polygaloides | White-margined Knotweed | POPO | POPO4 |
| Polygonum spp. | Knotweed | POLYG | POLYG4 |
| Polystichum lonchitis | Mountain Hollyfern | POLO2 | POLO4 |
| Potentilla glandulosa | Glandular or Sticky Cinquefoil | POGL | POGL9 |
| Potentilla glandulosa nevadensis | Glandular or Sticky Cinquefoil | POGLN | POGLN2 |
| Potentilla glandulosa pseudorupestris | Glandular or Sticky Cinquefoil | POGLP | POGLP2 |
| Potentilla gracilis | Northwest/Slender Cinquefoil | POGR | POGR9 |
| Potentilla spp. | Cinquefoil | POTEN | POTEN |
| Prunella vulgaris | Common Selfheal | PRVU | PRVU |
| Pteridium aquilinum | Bracken Fern/Brake Fern | PTAQ | PTAQ |
| Pyrola picta | White-vein Pyrola | PYPI | PYPI2 |
| Pyrola secunda | Sidebells Pyrola | PYSE | PYSE |
| Pyrola spp. | Pyrola/Wintergreen | PYROL | PYROL |
| Ranunculus glaberrimus | Sagebrush Buttercup | RAGL | RAGL |
| Ranunculus spp. | Buttercup | RANUN | RANUN |
| Ranunculus uncinatus | Little Buttercup | RAUN2 | RAUN |
| Rorippa curvisiliqua | Western Yellowcress | ROCU | ROCU |
| Rorippa spp. | Yellowcress | RORIP | RORIP |
| Rudbeckia occidentalis | Blackhead/Western Coneflower | RUOC | RUOC2 |
| Rumex acetosella | Sheep/Red Sorrel | RUAC | RUAC3 |
| Rumex crispus | Curly Dock | RUCR | RUCR |
| Rumex spp. | Dock | RUMEX | RUMEX |
| Sanguisorba minor | Garden Burnet | SAMI2 | SAMI3 |
| Sanguisorba occidentalis | Annual Burnet | SAOC | SAOC2 |
| Sanguisorba spp. | Burnet | SANGU | SANGU2 |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Scutellaria angustifolia | Narrowleaved Skullcap | SCAN | SCAN3 |
| Secale cereale | Cultivated Rye | SECE | SECE |
| Sedum lanceolatum | Lanceleaf Stonecrop | SELA2 | SELA |
| Sedum spp. | Stonecrop | SEDUM | SEDUM |
| Sedum stenopetalum | Wormleaf Stonecrop | SEST | SEST2 |
| Selaginella spp. | Selaginella | SELAG | SELAG |
| Senecio canus | Woolly Groundsel | SECA | SECA2 |
| Senecio integerrimus | Western/Woolly Groundsel | SEIN | SEIN2 |
| Senecio serra | Butterweed Groundsel | SESE | SESE2 |
| Senecio sphaerocephalus | Mountain Butterweed | SESP2 | SESP4 |
| Senecio spp. | Groundsel or Butterweed | SENEC | SENEC |
| Senecio streptanthifolius | Rocky Mountain Butterweed | SEST2 | SEST3 |
| Senecio triangularis | Arrowleaf Groundsel | SETR | SETR |
| Sidalcea oregana | Oregon Checkermallow | SIOR | SIOR |
| Silene antirrhina | Sleepy Cat | SIAN2 | SIAN2 |
| Silene menziesii | Menzies' Silene | SIME | SIME |
| Silene oregana | Oregon Catchfly | SIOR2 | SIOR3 |
| Silene spp. | Silene/Catchfly | SILEN | SILEN |
| Sisymbrium altissimum | Tumblemustard/Jim Hill Mustard | SIAL | SIAL2 |
| Smilacina racemosa | Feather Solomonplume | SMRA | SMRA |
| Smilacina stellata | Western False Solomon's Seal | SMST | SMST |
| Solidago missouriensis | Missouri Goldenrod | SOMI | SOMI2 |
| Solidago spp. | Goldenrod | SOLID | SOLID |
| Spergula arvensis | Stickwort | SPAR2 | SPAR |
| Spergularia rubra | Red Sandspurry | SPRU | SPRU |
| Sphaeralcea munroana | Munro's Globemallow | SPMU | SPMU2 |
| Stellaria jamesiana | Sticky Chickweed | STJA | STJA3 |
| Stellaria nitens | Shining Chickweed | STNI | STNI |
| Stellaria spp. | Chickweed | STELL | STELL |
| Streptopus amplexifolius | Claspleaf Twistedstalk | STAM | STAM2 |
| Synthyris missurica | Blue Kittentails | SYMI | SYMI |
| Taraxacum officinale | Common Dandelion | TAOF | TAOF |
| Taraxacum spp. | Dandelion | TARAX | TARAX |
| Thalictrum occidentale | Western Meadowrue | THOC | THOC |
| Tiarella trifoliata unifoliata | Coolwort Foamflower | TITRU | TITRU |
| Tonella floribunda | Tonella | TOFL2 | TOFL |
| Tragopogon dubius | Yellow Salsify | TRDU | TRDU |
| Trautvetteria caroliniensis | False Bugbane | TRCA3 | TRCA |
| Trifolium longipes | Longstalk Clover | TRLO | TRLO |
| Trifolium macrocephalum | Bighead Clover | TRMA | TRMA3 |
| Trifolium repens | White Clover | TRRE | TRRE3 |
| Trifolium spp. | Clover | TRIFO | TRIFO |
| Triticum aestivum | Cultivated Wheat | TRAE | TRAE |
| Urtica dioica | Stinging Nettle | URDI | URDI |
| Valeriana sitchensis | Sitka Valerian | VASI | VASI |
| Valeriana spp. | Valerian | VALER | VALER |
| Veratrum californicum | California Falsehellebore | VECA | VECA2 |
| Veratrum viride | Green Falsehellebore | VEVI | VEVI |
| Verbascum blattaria | Moth Mullein | VEBL | VEBL |
| Verbascum thapsus | Flannel Mullein | VETH | VETH |
| Verbena bracteata | Bracted Vervain | VEBR | VEBR |
| Veronica americana | American Speedwell | VEAM | VEAM2 |
| Veronica arvensis | Common Speedwell | VEAR | VEAR |
| Veronica peregrina | Purslane Speedwell | VEPE | VEPE2 |
| Vicia americana | American Vetch | VIAM | VIAM |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Vicia spp. | Vetch | VICIA | VICIA |
| Viola adunca | Early Blue Violet | VIAD | VIAD |
| Viola orbiculata | Round-leaved Violet | VIOR2 | VIOR |
| Viola purpurea | Goosefoot Violet | VIPU | VIPU4 |
| Viola spp. | Violet | VIOLA | VIOLA |
| Woodsia oregana | Oregon/Western Woodsia | WOOR | WOOR |
| Wyethia amplexicaulis | Mule's Ears/Northern Mule's Ear | WYAM | WYAM |
| Xerophyllum tenax | Beargrass | XETE | XETE |
| Zigadenus paniculatus | Panicled Death Camas | ZIPA | ZIPA2 |
| Zigadenus venenosus | Meadow/Deadly Death Camas | ZIVE | ZIVE |
| **GRASSES AND GRASSLIKES** | | | |
| Agropyron intermedium | Intermediate Wheatgrass | AGIN2 | AGIN2 |
| Agropyron repens | Quack Grass | AGRE | AGRE2 |
| Agropyron spicatum | Bluebunch Wheatgrass | AGSP | AGSP |
| Agropyron spp. | Wheatgrass | AGROP | AGROP2 |
| Agropyron trichophorum | Pubescent Wheatrass | AGTR2 | AGTR6 |
| Agrostis interrupta | Interrupted Bentgrass | AGIN3 | AGIN4 |
| Agrostis scabra | Winter Bentgrass/Tickle-grass | AGSC | AGSC5 |
| Agrostis spp. | Bentgrass | AGROS | AGROS2 |
| Alopecurus pratensis | Meadow Foxtail | ALPR | ALPR3 |
| Bromus brizaeformis | Rattlesnake Brome | BRBR | BRBR7 |
| Bromus carinatus | Mountain Brome | BRCA | BRCA5 |
| Bromus commutatus | Hairy Brome/Hairy Chess | BRCO | BRCO4 |
| Bromus inermis | Smooth Brome | BRIN | BRIN2 |
| Bromus japonicus | Japanese Brome | BRJA | BRJA |
| Bromus mollis | Soft Brome | BRMO | BRMO2 |
| Bromus spp. | Brome | BROMU | BROMU |
| Bromus tectorum | Cheatgrass Brome/Downy Chess | BRTE | BRTE |
| Bromus vulgaris | Columbia Brome | BRVU | BRVU |
| Calamagrostis rubescens | Pinegrass | CARU | CARU |
| Carex concinnoides | Northwest Sedge | CACO | CACO11 |
| Carex geyeri | Elk Sedge | CAGE | CAGE2 |
| Carex hoodii | Hood's Sedge | CAHO | CAHO5 |
| Carex rossii | Ross Sedge | CARO | CARO5 |
| Carex spp. | Sedge | CAREX | CAREX |
| Dactylis glomerata | Orchard Grass | DAGL | DAGL |
| Danthonia unispicata | Onespike Oatgrass | DAUN | DAUN |
| Deschampsia elongata | Slender Hairgrass | DEEL | DEEL |
| Elymus glaucus | Blue Wildrye | ELGL | ELGL |
| Festuca bromoides | Six Week's Fescue | FEBR | FEBR4 |
| Festuca idahoensis | Idaho Fescue | FEID | FEID |
| Festuca microstachys | Small Fescue | FEMI | FEMI2 |
| Festuca occidentalis | Western Fescue | FEOC | FEOC |
| Festuca ovina | Sheep Fescue | FEOV | FEOV |
| Festuca spp. | Fescue | FESTU | FESTU |
| Festuca viridula | Green Fescue | FEVI | FEVI |
| Juncus balticus | Baltic Rush | JUBA | JUBA |
| Juncus tenuis tenuis | Slender Rush | JUTET | JUTET |
| Koeleria cristata | Prairie Junegras | KOCR | KOCR |
| Lolium multiflorum | Italian Ryegrass/Annual Ryegrass | LOMU | LOMU |
| Lolium perenne | Perennial Ryegrass | LOPE2 | LOPE |
| Lolium spp. | Ryegrass | LOLIU | LOLIU |

| SCIENTIFIC NAME | COMMON NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Luzula campestris | Field Woodrush | LUCA2 | LUCA2 |
| Melica spectabilis | Showy Oniongrass | MESP | MESP |
| Melica spp. | Oniongrass | MELIC | MELIC |
| Melica subulata | Alaska Oniongrass | MESU | MESU |
| Muhlenbergia mexicana | Mexican Muhly | MUME | MUME2 |
| Phleum pratense | Common Timothy | PHPR | PHPR3 |
| Phleum spp. | Timothy | PHLEU | PHLEU |
| Poa bolanderi | Bolander's Bluegrass | POBO | POBO |
| Poa cusickii | Cusick's Bluegrass | POCU | POCU3 |
| Poa nervosa | Wheeler's Bluegrass | PONE | PONE2 |
| Poa nervosa wheeleri | Wheeler's Bluegrass | PONEW | PONEW |
| Poa palustris | Fowl Bluegrass | POPA | POPA2 |
| Poa pratensis | Kentucky Bluegrass | POPR | POPR |
| Poa sandbergii | Sandberg's Bluegrass | POSA3 | POSA12 |
| Poa spp. | Bluegrass | POA | POA |
| Sitanion hystrix | Bottlebrush Squirreltail | SIHY | SIHY |
| Sitanion hystrix hordeoides | Dwarf Squirreltail | SIHYH | SIHYH |
| Stipa commata | Needle-and-thread | STCO2 | STCO4 |
| Stipa lettermanii | Letterman Needlegrass | STLE | STLE4 |
| Stipa occidentalis | Western Needlegrass | STOC | STOC2 |
| Stipa occidentalis minor | Western Needlegrass | STOCM | STOCM |
| Stipa thurberiana | Thurber's Needlegrass | STTH | STTH2 |
| Trisetum canescens | Tall Trisetum | TRCA | TRCA21 |
| Trisetum spp. | Trisetum | TRISE | TRISE |
| Triticum spp. | Wheat | TRITI | TRITI |

# APPENDIX B. Species List (by Common Name)

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| **TREES** | | | |
| Douglas Fir | Pseudotsuga menziesii | PSME | PSME |
| Engelmann Spruce | Picea engelmannii | PIEN | PIEN |
| Grand Fir | Abies grandis | ABGR | ABGR |
| Lodgepole Pine | Pinus contorta | PICO | PICO |
| Ponderosa Pine | Pinus ponderosa | PIPO | PIPO |
| Subalpine Fir | Abies lasiocarpa | ABLA2 | ABLA |
| Western Larch | Larix occidentalis | LAOC | LAOC |
| **SHRUBS** | | | |
| Alder | Alnus spp. | ALNUS | ALNUS |
| American Twinflower | Linnaea borealis | LIBO2 | LIBO3 |
| Antelope Bitterbrush | Purshia tridentata | PUTR | PUTR2 |
| Baldhip Rose | Rosa gymnocarpa | ROGY | ROGY |
| Bearberry | Arctostaphylos uva-ursi | ARUV | ARUV |
| Bearberry Honeysuckle/Black Twinberry | Lonicera involucrata | LOIN | LOINS |
| Bebb Willow | Salix bebbiana | SABE | SABE2 |
| Big Huckleberry | Vaccinium membranaceum | VAME | VAME |
| Big Sagebrush | Artemisia tridentata | ARTR | ARTR2 |
| Birch/Shiny Leaf Spiraea | Spiraea betulifolia | SPBE | SPBE2 |
| Black Elderberry | Sambucus racemosa | SARA | SARA2 |
| Blueberry Elder | Sambucus cerulea | SACE | SACE3 |
| Booth Willow | Salix boothii | SABO2 | SABO2 |
| Bush/Shrubby Cinquefoil | Potentilla fruitcosa | POFR | POFR4 |
| Cascade Mountain Ash | Sorbus scopulina | SOSC2 | SOSC2 |
| Ceanothus | Ceanothus spp. | CEANO | CEANO |
| Common Prince's Pine | Chimaphila umbellata | CHUM | CHUM |
| Common Snowberry | Symphoricarpos albus | SYAL | SYAL |
| Creambush Oceanspray | Holodiscus discolor | HODI | HODI |
| Curlleaf Mountain Mahogany | Cercocarpus ledifolius | CELE | CELE3 |
| Currant or Gooseberry | Ribes spp. | RIBES | RIBES |
| Elderberry | Sambucus spp. | SAMBU | SAMBU |
| Fool's Huckleberry | Menziesia ferruginea | MEFE | MEFE |
| Gray Horsebrush | Tetradymia canescens | TECA | TECA2 |
| Gray Rabbitbrush | Chrysothamnus nauseosus | CHNA | CHNA2 |
| Green Rabbitbrush | Chrysothamnus viscidiflorus | CHVI | CHVI8 |
| Grouse Huckleberry/Whortleberry | Vaccinium scoparium | VASC | VASC |
| Lewis Mockorange/Syringa | Philadelphus lewisii | PHLE2 | PHLE4 |
| Little Prince's Pine/Pipissewa | Chimaphila menziesii | CHME | CHME |
| Low Oregongrape | Berberis repens | BERE | BERE |
| Mallow Ninebark | Physocarpus malvaceus | PHMA | PHMA5 |
| Mountain Big Sagebrush | Artemisia tridentata vaseyana | ARTRV | ARTRV |
| Mountain Snowberry | Symphoricarpos oreophilus | SYOR | SYOR2 |
| Oregon Boxwood | Pachistima myrsinites | PAMY | PAMY |
| Oregongrape | Berberis spp | BERBE | BERBE |
| Pinemat Manzanita | Arctostaphylos nevadensis | ARNE | ARNE |
| Poison Ivy, Poison Oak | Rhus radicans | RHRA | RHRA6 |
| Prickly Currant/Swamp Gooseberry | Ribes lacustre | RILA | RILA |
| Red Raspberry | Rubus idaeus | RUID | RUID |
| Redstem Ceanothus | Ceanothus sanguineus | CESA | CESA |
| Rocky Mountain Maple | Acer glabrum | ACGL | ACGL |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Rose | Roas spp. | ROSA | ROSA5 |
| Scouler Willow | Salix scouleriana | SASC | SASC |
| Sitka Alder | Alnus sinuata | ALSI | ALSI3 |
| Smooth Sumac | Rhus glabra | RHGL | RHGL |
| Snowberry | Symphoricarpos spp. | SYMPH | SYMPH |
| Snowbrush Ceanothus/Buckbrush | Ceanothus velutinus | CEVE | CEVE |
| Soapberry/Canada Buffaloberry | Shepherdia canadensis | SHCA | SHCA |
| Sticky Currant | Ribes viscosissimum | RIVI | RIVI3 |
| Utah Honeysuckle | Lonicera utahensis | LOUT2 | LOUT2 |
| Wax or Squaw Currant | Ribes cereum | RICE | RICE |
| Western Serviceberry | Amelanchier alnifolia | AMAL | AMAL2 |
| Western Thimbleberry | Rubus parviflorus | RUPA | RUPA |
| Willow | Salix spp. | SALIX | SALIX |
| Wood's Rose | Rosa woodsii | ROWO | ROWO |
| **FORBS** | | | |
| Agoseris | Agoseris spp. | AGOSE | AGOSE |
| Alpine Willow-weed | Epilobium alpinum | EPAL | EPAL |
| Alumroot | Heuchera spp. | HEUCH | HEUCH |
| American Speedwell | Veronica americana | VEAM | VEAM2 |
| American Vetch | Vicia americana | VIAM | VIAM |
| Annual Agoseris | Agoseris heterophylla | AGHE | AGHE2 |
| Annual Burnet | Sanguisorba occidentalis | SAOC | SAOC2 |
| Arnica | Arnica spp. | ARNIC | ARNIC |
| Arrowleaf Balsamroot | Balsamorhiza sagittata | BASA | BASA3 |
| Arrowleaf Groundsel | Senecio triangularis | SETR | SETR |
| Aster | Aster spp. | ASTER | ASTER |
| Avens | Geum spp. | GEUM | GEUM |
| Ballhead/Capitate Sandwort | Arenaria congesta | ARCO2 | ARCO5 |
| Ballhead Waterleaf/Woolly Breeches | Hydrophyllum capitatum | HYCA | HYCA4 |
| Bastard Toadflax | Linaria dalmatica | LIDA | LIDA |
| Beargrass | Xerophyllum tenax | XETE | XETE |
| Bedstraw | Galium spp. | GALIU | GALIU |
| Bicknell's Geranium | Geranium bicknellii | GEBI | GEBI2 |
| Big Chickweed | Cerastium vulgatum | CEVU | CEVU |
| Big Seed Biscuitroot | Lomatium macrocarpum | LOMA | LOMA3 |
| Bighead Clover | Trifolium macrocephalum | TRMA | TRMA3 |
| Bigleaf Sandwort | Arenaria macrophylla | ARMA3 | ARMA18 |
| Bigloss | Anchusa spp. | ANCHU | ANCHU |
| Biscuitroot/Desert Parsley | Lomatium spp. | LOMAT | LOMAT |
| Black Medic | Medicago lupulina | MELU | MELU |
| Blackhead/Western Coneflower | Rudbeckia occidentalis | RUOC | RUOC2 |
| Blepharipappus | Blepharipappus scaber | BLSC | BLSC |
| Bluebells | Mertensia spp. | MERTE | MERTE |
| Blueleaf/Broadpetal Strawberry | Fragaria virginiana | FRVI | FRVI |
| Blue Flax | Linum perenne | LIPE | LIPE2 |
| Blue Kittentails | Synthyris missurica | SYMI | SYMI |
| Blue Scorpion-grass | Myosotis micrantha | MYMI | MYMI |
| Bolander's Yampah | Perideridia bolanderi | PEBO | PEBO2 |
| Borage | Borago spp. | BORAG | BORAG |
| Bracken Fern/Brake Fern | Pteridium aquilinum | PTAQ | PTAQ |
| Bracted Lousewort | Pedicularis bracteosa | PEBR | PEBR |
| Bracted Vervain | Verbena bracteata | VEBR | VEBR |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Branded Peppergrass | Lepidium ramosissimum | LERA | LERA2 |
| Bristly Cryptantha | Cryptantha interrupta | CRIN3 | CRIN9 |
| Brittle Bladderfern | Cystopteris fragilis | CYFR | CYFR2 |
| Broad-leaf Bluebells | Mertensia ciliata | MECI | MECI3 |
| Broad-lipped Twayblade | Listera convallarioides | LICO2 | LICO5 |
| Buckwheat | Eriogonum spp. | ERIOG | ERIOG |
| Bulbiferous Fringecup | Lithophragma bulbifera | LIBU | LIBU2 |
| Bull/Common Thistle | Cirsium vulgare | CIVU | CIVU |
| Burnet | Sanguisorba spp. | SANGU | SANGU2 |
| Bushy Mentzelia | Mentzelia dispersa | MEDI | MEDI |
| Buttercup | Ranunculus spp. | RANUN | RANUN |
| Butterweed Groundsel | Senecio serra | SESE | SESE2 |
| California Falsehellebore | Veratrum californicum | VECA | VECA2 |
| Canada Milkvetch | Astragalus canadensis | ASCA7 | ASCA11 |
| Canada Thistle | Cirsium arvense | CIAR | CIAR4 |
| Catchweed Bedstraw/Cleavers | Galium aparine | GAAP | GAAP2 |
| Chickweed | Cerastium spp. | CERAS | CERAS |
| Chickweed | Stellaria spp. | STELL | STELL |
| Cinquefoil | Potentilla spp. | POTEN | POTEN |
| Claspleaf Twistedstalk | Streptopus amplexifolius | STAM | STAM2 |
| Clover | Trifolium spp. | TRIFO | TRIFO |
| Cluster Tarweed | Madia glomerata | MAGL | MAGL2 |
| Columbia Monkshood | Aconitum columbianum | ACCO | ACCO4 |
| Collomia | Collomia spp. | COLLO | COLLO |
| Common Camas | Camassia quamash | CAQU | CAQU2 |
| Common Clarkia | Clarkia rhomboidea | CLRH | CLRH |
| Common Cowparsnip | Heracleum lanatum | HELA | HELA4 |
| Common Cryptantha | Cryptantha intermedia | CRIN2 | CRIN8 |
| Common Dandelion | Taraxacum officinale | TAOF | TAOF |
| Common Eriophyllum/Woolly Sunflower | Eriophyllum lanatum | ERLA | ERLA6 |
| Common Forget-me-not | Myosotis scorpioides | MYSC | MYSC |
| Common Houndstongue | Cynoglossum officinale | CYOF | CYOF |
| Common Pearly-everlasting | Anaphalis margaritacea | ANMA | ANMA |
| Common Selfheal | Prunella vulgaris | PRVU | PRVU |
| Common/Slender Tarweed | Madia gracilis | MAGR | MAGR3 |
| Common Speedwell | Veronica arvensis | VEAR | VEAR |
| Common Willow-weed | Epilobium glandulosum | EPGL2 | EPGL4 |
| Common Yarrow | Achillea millefolium | ACMI | ACMI2 |
| Coolwort Foamflower | Tiarella trifoliata unifoliata | TITRU | TITRU |
| Corn Gromwell | Lithospermum arvense | LIAR | LIAR4 |
| Cotton-batting Plant | Gnaphalium chilense | GNCH | GNCH |
| Cous Biscuitroot | Lomatium cous | LOCO2 | LOCO4 |
| Cudweed | Gnaphalium spp. | GNAPH | GNAPH |
| Cultivated Rye | Secale cereale | SECE | SECE |
| Cultivated Wheat | Triticum aestivum | TRAE | TRAE |
| Curly Dock | Rumex crispus | RUCR | RUCR |
| Cushion Phlox | Phlox pulvinata | PHPU | PHPU5 |
| Cusick's Buckwheat | Eriogonum cusickii | ERCU | ERCU3 |
| Cusick's Milkvetch | Astragalus cusickii | ASCU4 | ASCU5 |
| Cusick's Peavine | Lathyrus nevadensis cusickii | LANEC | LANEC |
| Daisy or Fleabane | Erigeron spp. | ERIGE | ERIGE2 |
| Dandelion | Taraxacum spp. | TARAX | TARAX |
| Deerhorn/Pink Fairies | Clarkia pulchella | CLPU | CLPU |
| Dock | Rumex spp. | RUMEX | RUMEX |
| Douglas' Brodiaea | Brodiaea douglasii | BRDO | BRDO |
| Douglas' Knotweed | Polygonum douglasii | PODO | PODO4 |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Dovefoot Geranium | Geranium molle | GEMO | GEMO |
| Dragonhead | Dracocephalum parviflorum | DRPA | DRPA2 |
| Dwarf Monkeyflower | Mimulus nanus | MINA | MINA |
| Dwarf Yellow Fleabane | Erigeron chrysopsidis | ERCH | ERCH4 |
| Early Blue Violet | Viola adunca | VIAD | VIAD |
| Elegant Aster | Aster perelegans | ASPE | ASPE3 |
| Elegant Mariposa | Calochortus elegans | CAEL | CAEL |
| Enchanter's Nightshade | Circaea alpina | CIAL | CIAL |
| False Agoseris | Microseris troximoides | MITR | MITR5 |
| False Bugbane | Trautvetteria caroliniensis | TRCA3 | TRCA |
| Feather Solomonplume | Smilacina racemosa | SMRA | SMRA |
| Fernleaved Desert Parsley | Lomatium dissectum | LODI2 | LODI |
| Fernleaved Desert Parsley | Lomatium dissectum eatonii | LODIE | LODIE |
| Few-flowered Peavine | Lathyrus pauciflorus | LAPA2 | LAPA5 |
| Fiddleneck | Amsinckia spp. | AMSIN | AMSIN |
| Field Chickweed | Cerastium arvense | CEAR | CEAR4 |
| Field Filago | Filago arvensis | FIAR | FIAR2 |
| Fireweed | Epilobium angustifolium | EPAN | EPAN2 |
| Flannel Mullein | Verbascum thapsus | VETH | VETH |
| Forget-me-not | Myosotis spp. | MYOSO | MYOSO |
| Frasera | Frasera spp. | FRASE | FRASE |
| Fremont's Lamb's Quarters | Chenopodium fremontii | CHFR | CHFR3 |
| Fringecup | Lithophragma spp. | LITHO | LITHO2 |
| Gairdner's Yampah | Perideridia gairdneri | PEGA2 | PEGA3 |
| Garden Burnet | Sanguisorba minor | SAMI2 | SAMI3 |
| Glandular or Sticky Cinquefoil | Potentilla glandulosa | POGL | POGL9 |
| Glandular or Sticky Cinquefoil | Potentilla glandulosa nevadensis | POGLN | POGLN2 |
| Glandular or Sticky Cinquefoil | Potentilla glandulosa pseudorupestris | POGLP | POGLP2 |
| Globe Penstemon | Penstemon globosus | PEGL4 | PEGL5 |
| Golden Buckwheat | Eriogonum flavum | ERFL | ERFL4 |
| Goldenrod | Solidago spp. | SOLID | SOLID |
| Gooseberry-leaved Alumroot | Heuchera grossulariifolia | HEGR | HEGR8 |
| Gooseberry-leaved Alumroot | Heuchera grossulariifolia tenuifolia | HEGRT | HEGRT |
| Goosefoot Violet | Viola purpurea | VIPU | VIPU4 |
| Gray's Licoriceroot/Lovage | Ligusticum grayi | LIGR | LIGR |
| Green Falsehellebore | Veratrum viride | VEVI | VEVI |
| Groundsel or Butterweed | Senecio spp. | SENEC | SENEC |
| Hairy Golden Aster | Chrysopsis villosa | CHVI2 | CHVI10 |
| Hairy Milkvetch | Astragalus inflexus | ASIN2 | ASIN5 |
| Hairy Owl Clover | Orthocarpus hispidus | ORHI | ORHI |
| Hairy Rockcress | Arabis hirsuta | ARHI | ARHI |
| Hairy Rockcress | Arabis hirsuta glabrata | ARHIG | ARHIG |
| Harkness' Linanthus | Linanthus harknessii | LIHA | LIHA |
| Harsh Paintbrush | Castilleja hispida | CAHI2 | CAHI9 |
| Hawksbeard | Crepis spp. | CREPI | CREPI |
| Hawkweed | Hieracium spp. | HIERA | HIERA |
| Heartleaf Arnica | Arnica cordifolia | ARCO | ARCO9 |
| Holboell's Rockcress | Arabis holboellii | ARHO | ARHO2 |
| Hooker Evening Primrose | Oenothera hookeri | OEHO | OEHO |
| Horseweed | Conyza canadensis | COCA2 | COCA5 |
| Horseweed | Conyza canadensis glabrata | COCAG | COCAG |
| Horseweed | Conyza spp. | CONYZ | CONYZ |
| Hot Rock/Scabland Penstemon | Penstemon deustus | PEDE | PEDE4 |
| Houndstongue Hawkweed | Hieracium cynoglossoides | HICY | HICY |
| Indian Wheat | Plantago patagonica | PLPA | PLPA2 |
| Klamathweed, Common St. John's Wort | Hypericum perforatum | HYPE | HYPE |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Knotweed | Polygonum spp. | POLYG | POLYG4 |
| Lanceleaf Stonecrop | Sedum lanceolatum | SELA2 | SELA |
| Large-flower Agoseris | Agoseris grandiflora | AGGR | AGGR |
| Large-flowered Collinsia | Collinsia grandiflora | COGR | COGR2 |
| Large-flowered Collomia | Collomia grandiflora | COGR2 | COGR4 |
| Large-flowered Goldenweed | Haplopappus carthamoides | HACA | HACA5 |
| Largeleaf Avens | Geum macrophyllum | GEMA | GEMA4 |
| Larkspur | Delphinium spp. | DELPH | DELPH |
| Leafy/Sickletop Lousewort | Pedicularis racemosa | PERA | PERA |
| Lemon Tarweed | Madia citriodora | MACI | MACI2 |
| Lettuce | Lactuca spp. | LACTU | LACTU |
| Licoriceroot/Lovage | Ligusticum spp. | LIGUS | LIGUS |
| Little Buttercup | Ranunculus uncinatus | RAUN2 | RAUN |
| Little Larkspur | Delphinium bicolor | DEBI | DEBI |
| Longhorn Plectritis | Plectritis macrocera | PLMA3 | PLMA4 |
| Longleaf Evening Primrose | Oenothera heterantha | OEHE | OEHE |
| Long-leaved Ground Cherry | Physalis longifolia | PHLO2 | PHLO4 |
| Long-leaved Phlox | Phlox longifolia | PHLO | PHLO2 |
| Long-leaved/Tapertip Hawksbeard | Crepis acuminata | CRAC | CRAC2 |
| Longstalk Clover | Trifolium longipes | TRLO | TRLO |
| Low Gumweed | Grindelia nana | GRNA | GRNA |
| Low Pussytoes | Antennaria dimorpha | ANDI | ANDI2 |
| Lowland Cudweed | Gnaphalium palustre | GNPA | GNPA |
| Lupine | Lupinus spp. | LUPIN | LUPIN |
| Mariposa or Sego Lily | Calochortus spp. | CALOC | CALOC |
| Meadow/Deadly Death Camas | Zigadenus venenosus | ZIVE | ZIVE |
| Menzies' Silene | Silene menziesii | SIME | SIME |
| Milkvetch | Astragalus spp. | ASTRA | ASTRA |
| Miner's Lettuce | Montia perfoliata | MOPE | MOPE3 |
| Missouri Goldenrod | Solidago missouriensis | SOMI | SOMI2 |
| Mitrewort | Mitella spp. | MITEL | MITEL |
| Monkey-flower | Mimulus spp. | MIMUL | MIMUL |
| Moth Mullein | Verbascum blattaria | VEBL | VEBL |
| Mountain Arnica | Arnica latifolia | ARLA | ARLA8 |
| Mountain Arnica | Arnica latifolia latifolia | ARLAL | UNASSGND |
| Mountain Butterweed | Senecio sphaerocephalus | SESP2 | SESP4 |
| Mountain Hollyfern | Polystichum lonchitis | POLO2 | POLO4 |
| Mountain Sweet-cicely | Osmorhiza chilensis | OSCH | OSCH |
| Mountain Tansymustard | Descurainia richardsonii | DERI | DERI2 |
| Mountain Tansymustard | Descurainia richardsonii sonnei | DERIS | DERIS |
| Mule's Ears/Northern Mule's Ear | Wyethia amplexicaulis | WYAM | WYAM |
| Munro's Globemallow | Sphaeralcea munroana | SPMU | SPMU2 |
| Musk Monkeyflower | Mimulus moschatus | MIMO | MIMO3 |
| Narrow-leaf Collomia | Collomia linearis | COLI2 | COLI2 |
| Narrow-leaf Pussytoes | Antennaria stenophylla | ANST | ANST2 |
| Narrowleaved Skullcap | Scutellaria angustifolia | SCAN | SCAN3 |
| Nettleleaf Horsemint | Agastache urticifolia | AGUR | AGUR |
| Nineleaf Desert Parsley | Lomatium triternatum | LOTR | LOTR2 |
| Nineleaf Desert Parsley | Lomatium triternatum platycarpum | LOTRP | LOTRP |
| Nodding Microseris | Microseris nutans | MINU | MINU |
| Northern Buckwheat | Eriogonum compositum | ERCO5 | ERCO12 |
| Northern Bedstraw | Galium boreale | GABO | GABO2 |
| Northwest/Slender Cinquefoil | Potentilla gracilis | POGR | POGR9 |
| Oak Fern | Gymnocarpium dryopteris | GYDR | GYDR |
| Onion | Allium spp. | ALLIU | ALLIU |

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|---|---|---|---|
| Oregon Catchfly | Silene oregana | SIOR2 | SIOR3 |
| Oregon Checkermallow | Sidalcea oregana | SIOR | SIOR |
| Oregon Twinpod | Physaria oregana | PHOR | PHOR2 |
| Oregon/Western Woodsia | Woodsia oregana | WOOR | WOOR |
| Paintbrush | Castilleja spp. | CASTI | CASTI2 |
| Pale Agoseris | Agoseris glauca | AGGL | AGGL |
| Pale Alyssum | Alyssum alyssoides | ALAL | ALAL3 |
| Panicled Death Camas | Zigadenus paniculatus | ZIPA | ZIPA2 |
| Penstemon | Penstemon spp. | PENST | PENST |
| Pepperweed, Peppergrass | Lepidium spp. | LEPID | LEPID |
| Phacelia | Phacelia spp. | PHACE | PHACE |
| Phlox | Phlox spp. | PHLOX | PHLOX |
| Pigweed | Amaranthus spp. | AMARA | AMARA |
| Pincushion Plant | Navarretia intertexta | NAIN | NAIN2 |
| Pinewoods Cryptantha | Cryptantha simulans | CRSI | CRSI2 |
| Pink Microsteris | Microsteris gracilis | MIGR | MIGR |
| Pinnate Tansymustard | Descurainia pinnata | DEPI | DEPI |
| Prairie Pepperweed | Lepidium densiflorum | LEDE | LEDE |
| Prickly Lettuce | Lactuca serriola | LASE | LASE |
| Prickly Pear Cactus | Opuntia polycantha | OPPO | OPPO |
| Purslane Speedwell | Veronica peregrina | VEPE | VEPE2 |
| Pussytoes | Antennaria spp. | ANTEN | ANTEN |
| Pyrola/Wintergreen | Pyrola spp. | PYROL | PYROL |
| Queen's Cup Beadlily | Clintonia uniflora | CLUN | CLUN2 |
| Rattlesnake-plantain | Goodyera oblongifolia | GOOB | GOOB2 |
| Rayless Daisy | Erigeron inornatus | ERIN2 | ERIN2 |
| Red Avens/Old Man's Whiskers | Geum triflorum | GETR | GETR |
| Red Avens/Old Man's Whiskers | Geum triflorum campanulatum | GETRC | GETRC |
| Red Avens/Old Man's Whiskers | Geum triflorum triflorum | GETRT | GETRT |
| Red Kittentail/Red Besseya | Besseya rubra | BERU | BERU |
| Red Sandspurry | Spergularia rubra | SPRU | SPRU |
| Rigid Fiddleneck | Amsinckia retrorsa | AMRE2 | AMRE2 |
| Rockcress | Arabis spp. | ARABI | ARABI2 |
| Rocky Mountain Butterweed | Senecio streptanthifolius | SEST2 | SEST3 |
| Rosy Pussytoes | Antennaria microphylla | ANMI2 | ANMI3 |
| Rough Bedstraw | Galium asperrimum | GAAS | GAAS3 |
| Roundleaf Lava Alumroot | Heuchera cylindrica | HECY | HECY2 |
| Round-leaved Violet | Viola orbiculata | VIOR2 | VIOR |
| Ryberg's Penstemon | Penstemon rydbergii | PERY | PERY |
| Sagebrush Buttercup | Ranunculus glaberrimus | RAGL | RAGL |
| Sagebrush Mariposa | Calochortus macrocarpus | CAMA | CAMA5 |
| Sandwort | Arenaria spp. | ARENA | ARENA |
| Scarlet Paintbrush | Castilleja miniata | CAMI2 | CAMI12 |
| Selaginella | Selaginella spp. | SELAG | SELAG |
| Serrated Balsamroot | Balsamorhiza serrata | BASE | BASE2 |
| Shaggy Fleabane | Erigeron pumilus | ERPU | ERPU2 |
| Shasta Aster | Machaeranthera shastensis | MASH | MASH |
| Sheep/Red Sorrel | Rumex acetosella | RUAC | RUAC3 |
| Sheldon's Milkvetch | Astragalus reventus sheldonii | ASRES | ASRES |
| Shepherd's Purse | Capsella bursa-pastoris | CABU | CABU2 |
| Shining Chickweed | Stellaria nitens | STNI | STNI |
| Shooting-star | Dodecatheon spp. | DODEC | DODEC |
| Showy Aster | Aster conspicuus | ASCO | ASCO3 |
| Showy Fleabane | Erigeron speciosus | ERSP | ERSP4 |
| Shrub Penstemon | Penstemon fruticosus | PEFR3 | PEFR3 |
| Sidebells Pyrola | Pyrola secunda | PYSE | PYSE |

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|---|---|---|---|
| Side-flowered Mitrewort | Mitella stauropetala | MIST2 | MIST3 |
| Silene/Catchfly | Silene spp. | SILEN | SILEN |
| Silky Lupine | Lupinus sericeus | LUSE | LUSE4 |
| Silky Lupine | Lupinus sericeus sericeus | LUSES | LUSES2 |
| Silverleaf Phacelia | Phacelia hastata | PHHA | PHHA |
| Silverleaf Phacelia | Phacelia hastata leucophylla | PHHAL | PHHAL |
| Sitka/Red Columbine | Aquilegia formosa | AQFO | AQFO |
| Sitka Valerian | Valeriana sitchensis | VASI | VASI |
| Skunkleaved Polemonium/Jacob's Ladder | Polemonium pulcherrimum | POPU | POPU3 |
| Sleepy Cat | Silene antirrhina | SIAN2 | SIAN2 |
| Slender Cryptantha | Cryptantha affinis | CRAF | CRAF |
| Slender Cudweed | Gnaphalium microcephalum | GNMI | GNMI |
| Slender Hawksbeard | Crepis atrabarba | CRAT | CRAT |
| Slender Plantain | Plantago elongata | PLEL | PLEL |
| Slender Pussytoes | Antennaria racemosa | ANRA | ANRA |
| Slenderfruit/Bicolor Biscuitroot | Lomatium leptocarpum | LOLE | LOLE2 |
| Slim/Dwarf Larkspur | Delphinium depauperatum | DEDE | DEDE2 |
| Small-fld Willow-weed | Epilobium minutum | EPMI | EPMI |
| Small-flowered Blue-eyed Mary | Collinsia parviflora | COPA | COPA3 |
| Small-flowered Fringecup | Lithophragma parviflora | LIPA | LIPA5 |
| Small-flowered Geranium | Geranium pusillum | GEPU | GEPU2 |
| Small-flowered Gymnosteris | Gymnosteris parvula | GYPA2 | GYPA2 |
| Smooth Willow-weed | Epilobium glaberrimum | EPGL | EPGL |
| Smooth Willow-weed | Epilobium glaberrimum fastigiatum | EPGLF | EPGLF2 |
| Snake River Phlox | Phlox colubria | PHCO2 | PHCO10 |
| Spotted Coral Root | Corallorhiza maculata | COMA3 | COMA4 |
| Spreading Dogbane | Apocynum androsaemifolium | APAN | APAN2 |
| Spreading Dogbane | Apocynum androsaemifolium pumilum | APANP | APANP |
| Spreading Groundsmoke | Gayophytum diffusum | GADI | GADI2 |
| Spring Whitlow-grass | Draba verna | DRVE2 | DRVE2 |
| Spurred Lupine | Lupinus laxiflorus | LULA2 | LULA3 |
| St. John's Wort | Hypericum spp. | HYPER | HYPER |
| Stickwort | Spergula arvensis | SPAR2 | SPAR |
| Sticky Chickweed | Cerastium viscosum | CEVI | CEVI3 |
| Sticky Chickweed | Stellaria jamesiana | STJA | STJA3 |
| Sticky Geranium | Geranium viscosissimum | GEVI | GEVI2 |
| Sticky Phlox | Phlox viscida | PHVI3 | PHVI3 |
| Stinging Nettle | Urtica dioica | URDI | URDI |
| Stork's Bill/Filaree | Erodium cicutarium | ERCI | ERCI6 |
| Strawberry | Fragaria spp. | FRAGA | FRAGA |
| Streambank Globemallow | Iliamna rivularis | ILRI | ILRI |
| Stonecrop | Sedum spp. | SEDUM | SEDUM |
| Subalpine Daisy | Erigeron peregrinus | ERPE | ERPE3 |
| Swaledesert Parsley | Lomatium ambiguum | LOAM | LOAM |
| Sweetclover | Melilotus spp. | MELIL | MELIL |
| Sweetscented Bedstraw | Galium triflorum | GATR | GATR3 |
| Tailcup Lupine | Lupinus caudatus | LUCA | LUCA |
| Tall Annual Willow-weed | Epilobium paniculatum | EPPA | EPPA2 |
| Tall bluebells | Mertensia paniculata | MEPA | MEPA |
| Tall Pussytoes | Antennaria anaphaloides | ANAN | ANAN2 |
| Tapertip Onion | Allium acuminatum | ALAC | ALAC4 |
| Tarweed | Madia spp. | MADIA | MADIA |
| Thin-leaved Owl Clover | Orthocarpus tenuifolius | ORTE | ORTE2 |
| Thistle | Cirsium spp. | CIRSI | CIRSI |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Threadleaf Fleabane | Erigeron filifolius | ERFI | ERFI2 |
| Threadleaf Phacelia | Phacelia linearis | PHLI | PHLI |
| Three-toothed Mitrewort | Mitella trifida | MITR2 | MITR4 |
| Thyme-leaf Sandwort | Arenaria serpyllifolia | ARSE | ARSE2 |
| Tolmie's Onion | Allium tolmiei | ALTO | ALTO |
| Tolmie's Onion | Allium tolmiei platyphyllum | ALTOP | ALTOP2 |
| Tonella | Tonella floribunda | TOFL2 | TOFL |
| Torrey's Cryptantha | Cryptantha torreyana | CRTO | CRTO4 |
| Trail/Pathfinder Plant | Adenocaulon bicolor | ADBI | ADBI |
| Tufted Phlox | Phlox caespitosa | PHCA2 | PHCA7 |
| Tumblemustard/Jim Hill Mustard | Sisymbrium altissimum | SIAL | SIAL2 |
| Turpentine Cymopterus | Cymopterus terebinthinus foeniculaceus | CYTEF | CYTEF |
| Twayblade | Listera spp. | LISTE | LISTE |
| Twin Arnica | Arnica sororia | ARSO | ARSO2 |
| Upland Larkspur | Delphinium nuttallianum | DENU3 | DENU2 |
| Valerian | Valeriana spp. | VALER | VALER |
| Varileaf Phacelia | Phacelia heterophylla | PHHE | PHHE2 |
| Vetch | Vicia spp. | VICIA | VICIA |
| Violet | Viola spp. | VIOLA | VIOLA |
| Wall Bedstraw | Galium parisiense | GAPA2 | GAPA5 |
| Wartberry Fairybells | Disporum trachycarpum | DITR | DITR2 |
| Watson's Willow-weed | Epilobium watsonii | EPWA | EPWA3 |
| Watson's Willow-weed | Epilobium watsonii occidentale | EPWAO | EPWAO2 |
| Wavy-leaved Paintbrush | Castilleja applegatei | CAAP2 | CAAP4 |
| Wayside Gromwell | Lithospermum ruderale | LIRU | LIRU4 |
| Weak-stemmed Cryptantha | Cryptantha flaccida | CRFL | CRFL4 |
| Western False Solomon's Seal | Smilacina stellata | SMST | SMST |
| Western Goldthread | Coptis occidentalis | COOC2 | COOC |
| Western Hawkweed | Hieracium albertinum | HIAL2 | HIAL |
| Western Houndstongue | Cynoglossum occidentale | CYOC | CYOC |
| Western Meadowrue | Thalictrum occidentale | THOC | THOC |
| Western mugwort | Artemisia ludoviciana | ARLU | ARLU |
| Western Sweet-cicely | Osmorhiza occidentalis | OSOC | OSOC |
| Western Twayblade | Listera caurina | LICA3 | LICA10 |
| Western/Woolly Groundsel | Senecio integerrimus | SEIN | SEIN2 |
| Western Yellowcress | Rorippa curvisiliqua | ROCU | ROCU |
| White Clover | Trifolium repens | TRRE | TRRE3 |
| White Hawkweed | Hieracium albiflorum | HIAL | HIAL2 |
| White-margined Knotweed | Polygonum polygaloides | POPO | POPO4 |
| White-stemmed frasera | Frasera albicaulis | FRAL2 | FRAL2 |
| White Sweetclover | Melilotus alba | MEAL | MEAL12 |
| White-vein Pyrola | Pyrola picta | PYPI | PYPI2 |
| Wilcox's Penstemon | Penstemon wilcoxii | PEWI | PEWI |
| Wild Oats | Avena fatua | AVFA | AVFA |
| Wild Red Baneberry | Actaea rubra | ACRU | ACRU2 |
| Willow-weed | Epilobium spp. | EPILO | EPILO |
| Windflower | Anemone piperi | ANPI | ANPI |
| Wiry/Palouse Knotweed | Polygonum majus | POMA2 | POMA9 |
| Woodrush Pussytoes | Antennaria luzuloides | ANLU | ANLU2 |
| Woods Strawberry | Fragaria vesca | FRVE | FRVE |
| Woodybranch Rockcress | Arabis lignifera | ARLI | ARLI |
| Woolly Balsamroot | Balsamorhiza incana | BAIN | BAIN |
| Woolly Groundsel | Senecio canus | SECA | SECA2 |
| Woolly Lupine | Lupinus leucophyllus tenuispicus | LULET | LULET |
| Woolly Weed | Hieracium scouleri | HISC | HISC2 |
| Wormleaf Stonecrop | Sedum stenopetalum | SEST | SEST2 |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Wyeth's Creamy Buckwheat | Eriogonum heracleoides | ERHE | ERHE2 |
| Yampah | Perideridia spp. | PERID | PERID |
| Yellow Bells | Fritillaria pudica | FRPU | FRPU2 |
| Yellowcress | Rorippa spp. | RORIP | RORIP |
| Yellow Salsify | Tragopogon dubius | TRDU | TRDU |
| Yellow Sweetclover | Melilotus officinalis | MEOF | MEOF |
| **GRASSES AND GRASSLIKES** | | | |
| Alaska Oniongrass | Melica subulata | MESU | MESU |
| Baltic Rush | Juncus balticus | JUBA | JUBA |
| Bentgrass | Agrostis spp. | AGROS | AGROS2 |
| Blue Wildrye | Elymus glaucus | ELGL | ELGL |
| Bluebunch Wheatgrass | Agropyron spicatum | AGSP | AGSP |
| Bluegrass | Poa spp. | POA | POA |
| Bolander's Bluegrass | Poa bolanderi | POBO | POBO |
| Bottlebrush Squirreltail | Sitanion hystrix | SIHY | SIHY |
| Brome | Bromus spp. | BROMU | BROMU |
| Cheatgrass Brome/Downy Chess | Bromus tectorum | BRTE | BRTE |
| Columbia Brome | Bromus vulgaris | BRVU | BRVU |
| Common Timothy | Phleum pratense | PHPR | PHPR3 |
| Cusick's Bluegrass | Poa cusickii | POCU | POCU3 |
| Dwarf Squirreltail | Sitanion hystrix hordeoides | SIHYH | SIHYH |
| Elk Sedge | Carex geyeri | CAGE | CAGE2 |
| Fescue | Festuca spp. | FESTU | FESTU |
| Field Woodrush | Luzula campestris | LUCA2 | LUCA2 |
| Fowl Bluegrass | Poa palustris | POPA | POPA2 |
| Green Fescue | Festuca viridula | FEVI | FEVI |
| Hairy Brome/Hairy Chess | Bromus commutatus | BRCO | BRCO4 |
| Hood's Sedge | Carex hoodii | CAHO | CAHO5 |
| Idaho Fescue | Festuca idahoensis | FEID | FEID |
| Intermediate Wheatgrass | Agropyron intermedium | AGIN2 | AGIN2 |
| Interrupted Bentgrass | Agrostis interrupta | AGIN3 | AGIN4 |
| Italian Ryegrass/Annual Ryegrass | Lolium multiflorum | LOMU | LOMU |
| Japanese Brome | Bromus japonicus | BRJA | BRJA |
| Kentucky Bluegrass | Poa pratensis | POPR | POPR |
| Letterman Needlegrass | Stipa lettermanii | STLE | STLE4 |
| Meadow Foxtail | Alopecurus pratensis | ALPR | ALPR3 |
| Mexican Muhly | Muhlenbergia mexicana | MUME | MUME2 |
| Mountain Brome | Bromus carinatus | BRCA | BRCA5 |
| Needle-and-thread | Stipa commata | STCO2 | STCO4 |
| Northwest Sedge | Carex concinnoides | CACO | CACO11 |
| Onespike Oatgrass | Danthonia unispicata | DAUN | DAUN |
| Oniongrass | Melica spp. | MELIC | MELIC |
| Orchard Grass | Dactylis glomerata | DAGL | DAGL |
| Perennial Ryegrass | Lolium perenne | LOPE2 | LOPE |
| Pinegrass | Calamagrostis rubescens | CARU | CARU |
| Prairie Junegras | Koeleria cristata | KOCR | KOCR |
| Pubescent Wheatrass | Agropyron trichophorum | AGTR2 | AGTR6 |
| Quack Grass | Agropyron repens | AGRE | AGRE2 |
| Rattlesnake Brome | Bromus brizaeformis | BRBR | BRBR7 |
| Ross Sedge | Carex rossii | CARO | CARO5 |
| Ryegrass | Lolium spp. | LOLIU | LOLIU |
| Sandberg's Bluegrass | Poa sandbergii | POSA3 | POSA12 |
| Sedge | Carex spp. | CAREX | CAREX |

| COMMON NAME | SCIENTIFIC NAME | R6 CODE | PLANTS CODE |
|---|---|---|---|
| Sheep Fescue | Festuca ovina | FEOV | FEOV |
| Showy Oniongrass | Melica spectabilis | MESP | MESP |
| Six Week's Fescue | Festuca bromoides | FEBR | FEBR4 |
| Slender Hairgrass | Deschampsia elongata | DEEL | DEEL |
| Slender Rush | Juncus tenuis tenuis | JUTET | JUTET |
| Small Fescue | Festuca microstachys | FEMI | FEMI2 |
| Smooth Brome | Bromus inermis | BRIN | BRIN2 |
| Soft Brome | Bromus mollis | BRMO | BRMO2 |
| Tall Trisetum | Trisetum canescens | TRCA | TRCA21 |
| Thurber's Needlegrass | Stipa thurberiana | STTH | STTH2 |
| Timothy | Phleum spp. | PHLEU | PHLEU |
| Trisetum | Trisetum spp. | TRISE | TRISE |
| Western Fescue | Festuca occidentalis | FEOC | FEOC |
| Western Needlegrass | Stipa occidentalis | STOC | STOC2 |
| Western Needlegrass | Stipa occidentalis minor | STOCM | STOCM |
| Wheat | Triticum spp. | TRITI | TRITI |
| Wheatgrass | Agropyron spp. | AGROP | AGROP2 |
| Wheeler's Bluegrass | Poa nervosa | PONE | PONE2 |
| Wheeler's Bluegrass | Poa nervosa wheeleri | PONEW | PONEW |
| Winter Bentgrass/Tickle-grass | Agrostis scabra | AGSC | AGSC5 |

## Appendix C. Wildfires Used in the Study
**(These fires burned during the period 1986 - 1994)**

**Wallowa-Whitman NF**

**Wallowa Valley RD**

| | |
|---|---|
| 1986 | Kuhn Ridge |
| | Gould Gulch |
| | Fire Ridge |
| | Joseph - Starvation |
| | Burn Spring |
| 1989 | Canal |
| 1994 | Thomason Complex |

**Hells Canyon NRA**

| | |
|---|---|
| 1985 | Pleasant Valley Exclosure |
| 1986 | Sheep Divide (Middle Point) |
| 1988 | Teepee Butte |
| 1989 | Summit |
| 1994 | Twin Lakes |
| | Rapid River (in Idaho) |

**Burnt Powder Fire Zone (Baker, Pine, and Unity RD)**

| | |
|---|---|
| 1986 | Blue Canyon |
| | Clear |
| | Cornet |
| | Eagle |
| | Sunflower/Cottonwood |
| | Huckleberry |
| | Dark Canyon |
| 1989 | Dooley |
| 1994 | Twin Lakes |

**Umatilla NF**

**North Fork John Day RD**

| | |
|---|---|
| 1986 | Crane Creek |
| 1987 | Ryder Creek |

**Malheur NF**

**Bear Valley RD**

| | |
|---|---|
| 1986 | Scalp |

**Burns RD**

| | |
|---|---|
| 1994 | Jordan Springs |

**Prairie City RD**

| | |
|---|---|
| 1986 | Deardorff |
| 1990 | Snowshoe |

Appendix D. Capsulized Characteristics of the Fires Used in the Study

**Wallowa-Whitman National Forest**

**Hells Canyon NRA**

Sheep Divide (1986) (Middle Point)
Burned August 10
Acreage = 2265
Intensity: low = 68%; medium = 11%; high = 21%
Vegetation = 40% ponderosa pine - Douglas-fir
10% grand fir
50% Idaho fescue and bluebunch wheatgrass

Teepee Butte (1988)
Burned August 25 to September 15
Acreage = 54,300
Intensity: low = 76%; medium = 7%; high = 17%
Vegetation = 19% grand fir
18% Douglas-fir
62% bunchgrass/rock
1% other

Summit (1989)
Burned July 26 to August 14
Acreage = 8000
Intensity: low = 23%; medium = 74%; high = 3%
Vegetation = 95% subalpine fir/grouse huckleberry
5% wet and dry meadows

Twin Lakes (1994)
Started August 28th
Acreage = 19,782
Intensity: low = 67%; medium = 15%; high = 18%
Vegetation = 86% forest
14% non-forest

Rapid River (1994)
Started August 3rd
Acreage = 7868
Intensity: low = 7068; medium = 400; high = 400
Vegetation = 80% forest
20% non-forest

**Wallowa Valley RD**

Joseph-Starvation Complex (1986)
Started August 10th
Acreage = 40,163

Kuhn Ridge (1986)
Started August 10th
Acreage = 2,200

Burn Spring (1986)
Started August 11th
Acreage = 10

Gould Gulch (1986)
Started August 10th
Acreage = 1,040

Fire Ridge (1986) Started August 10th
Acreage = 960

Canal (1989) Burned July 26 to August 14
Acreage = 21,898
Intensity: low = 44%; medium = 13%; high = 43%
Vegetation = 38% subalpine fir
38% grand fir
2% Douglas-fir - ponderosa pine
22% open

Thomason Complex (1994) Started August 28th
Acreage = 7720
Intensity: low = 95%; medium = 0%; high = 5%
Vegetation = 42% forest
58% non-forest

**Burnt River Fire Zone**

Blue Canyon (1986) Burned August 2 to August 7
Acreage = 169
Intensity: low = 55%; medium = 15%; high = 30%
Vegetation = 60% ponderosa pine/bunchgrass
40% ponderosa pine/rabbitbrush

Clear (1986) Burned August 4 to August 11
Acreage = 6400
Intensity: low = 58%; medium = 6%; high = 36%
Vegetation = 15% subalpine fir/grouse huckleberry
10% subalpine fir-whitebark pine/elk sedge
65% lodgepole pine
10% mountain big sage and dry meadows

Cornet (1986) Burned August 2 to August 7
Acreage = 1730
Intensity: low = 25%; medium = 19%; high = 56%
Vegetation = 54% ponderosa pine - Douglas-fir/elk sedge
23% ponderosa pine/bluebunch wheatgrass
23% mountain big sage/bunchgrass

Dark Canyon (1986) Burned August 2 to August 7
Acreage = 1594
Intensity: low = 24%; medium = 26%; high = 50%
Vegetation = 30% ponderosa pine/bluebunch wheatgrass
40% grand fir/pinegrass-elk sedge
20% Douglas-fir
10% ponderosa pine

Eagle (1986) Burned August 2 to August 8
Acreage = 308
Intensity: low = 30%; medium = 30%; high = 40%
Vegetation = ponderosa pine - Douglas-fir
ponderosa pine/Idaho fescue
Sandberg's bluegrass - onespike oatgrass

Huckleberry (1986) Burned August 2 to August 9
Acreage = 8,264
Intensity: low = 18%; medium = 44%; high = 38%
Vegetation = 50% grand fir/pinegrass
30% ponderosa pine - Douglas-fir/elk sedge
20% ponderosa pine/bunchgrass

Sunflower/Cottonwood (1986) Burned August 2 to August 9
Acreage = 2906
Intensity: low = 27%; medium = 24%; high = 49%
Vegetation = 70% Douglas-fir
20% ponderosa pine-w. juniper/mtn. mahogany
10% grand fir

Dooley (1989) Burned July 26 to August 6
Acreage = 10,240
Intensity: low = 23%; medium = 22%; high = 55%
Vegetation = ponderosa pine - Douglas-fir/elk sedge
grand fir/pinegrass

**Malheur National Forest**

**Bear Valley RD**

Scalp (1986)
Acreage = 485
Intensity: low = 20%; medium = 30%; high = 50%
Vegetation = 60% Douglas-fir/grand fir
40% ponderosa pine

**Burns RD**

Jordan Springs (1994) Burned August 27 to September 5
Acreage = 4906
Intensity: low = 45%; medium = 35%; high = 20%
Vegetation: ponderosa pine/mountain big sage/bunchgrass
grand fir/pinegrass and elk sedge
mountain mahogany

**Prairie City RD**

Deardorff (1986)
Acreage = 945
Intensity: low = 85%; medium = 0%; high = 15%
Vegetation: ponderosa pine and grand fir

Snowshoe (1990)
Burned August 6 to August 21
Acreage = 12,530
Intensity: low = 14%; medium = 33%; high = 53%
Vegetation: grand fir/elk sedge; grand fir/pinegrass; grand fir/grouse huckleberry; grand fir/ twinflower; grand fir/ big huckleberry; subalpine fir/grouse huckleberry.

**Umatilla National Forest**

**North Fork John Day RD**

Crane Creek (1986)
Started August 11th
Acreage = 5800

Ryder Creek (1987)
Burned August 13th to December 1st
Acreage = 14,650

Appendix E. Selected Plant Responses to Fire Severities (after the first and fifth years)
(+) = increase; (-) = decrease; (0) = no change

| TREES | 1st Year | | | 5th Year | | |
|---|---|---|---|---|---|---|
| | Light | Moderate | Severe | Light | Moderate | Severe |
| **SUBALPINE FIR SERIES** | | | | | | |
| subalpine fir | No Data | - | - | No Data | - | - |
| grand fir | No Data | - | - | No Data | - | - |
| Engelmann spruce | No Data | - | - | No Data | - | - |
| lodgepole pine | No Data | - | - | No Data | + | + |
| **GRAND FIR SERIES (cool,moist)** | | | | | | |
| grand fir | - | - | - | No Data | + | 0 |
| Douglas-fir | No Data | - | - | No Data | + | + |
| western larch | No Data | + | - | No Data | + | + |
| lodgepole pine | No Data | - | - | No Data | + | + |
| **GRAND FIR SERIES (warm,dry)** | | | | | | |
| grand fir | No Data | - | - | No Data | - | - |
| Douglas-fir | No Data | 0 | - | No Data | 0 | + |
| western larch | No Data | - | - | No Data | 0 | + |
| lodgepole pine | No Data | - | - | No Data | + | + |
| ponderosa pine | No Data | 0 | - | No Data | 0 | + |
| **DOUGLAS-FIR SERIES** | | | | | | |
| Douglas-fir | 0 | 0 | - | 0 | 0 | - |
| ponderosa pine | 0 | 0 | - | + | 0 | - |
| **PONDEROSA PINE SERIES** | | | | | | |
| ponderosa pine | + | No Data | - | + | No Data | - |

| SHRUBS | 1st Year | | | 5th Year | | |
|---|---|---|---|---|---|---|
| **FORESTS** | **Light** | **Moderate** | **Severe** | **Light** | **Moderate** | **Severe** |
| **SUBALPINE FIR SERIES** | | | | | | |
| fool's huckleberry | No Data | No Data | - | No Data | No Data | + |
| big huckleberry | No Data | - | - | No Data | + | + |
| grouse huckleberry | No Data | - | - | No Data | + | + |
| gooseberries/currents | No Data | No Data | 0 | No Data | + | + |
| Utah honeysuckle | No Data | - | 0 | No Data | + | + |
| Scouler willow | No Data | + | + | No Data | 0 | + |
| twinflower | No Data | No Data | - | No Data | No Data | - |
| black elderberry | No Data | + | + | No Data | No Data | + |
| **GRAND FIR SERIES (cool,moist)** | | | | | | |
| twinflower | No Data | - | No Data | No Data | + | No Data |
| snowbrush ceanothus | No Data | No Data | + | No Data | + | + |
| creeping Oregon-grape | No Data | No Data | + | No Data | + | + |
| big huckleberry | No Data | - | - | No Data | + | No Data |
| Utah honeysuckle | 0 | - | - | 0 | - | No Data |
| Scouler willow | 0 | 0 | + | + | + | + |
| birchleaf spiraea | No Data | - | + | No Data | + | 0 |
| **GRAND FIR SERIES (warm,dry)** | | | | | | |
| snowbrush ceanothus | No Data | No Data | No Data | No Data | 0 | + |
| creeping Oregon-grape | No Data | No Data | No Data | No Data | No Data | 0 |
| Scouler willow | No Data | No Data | No Data | No Data | 0 | 0 |
| grouse huckleberry | No Data | No Data | No Data | No Data | + | + |
| birchleaf spiraea | No Data | No Data | No Data | No Data | No Data | 0 |
| **DOUGLAS-FIR SERIES** | | | | | | |
| ninebark | No Data | - | - | No Data | + | + |
| birchleaf spiraea | 0 | 0 | - | 0 | 0 | + |
| common snowberry | 0 | 0 | - | 0 | 0 | + |
| redstem ceanothus | No Data | No Data | + | No Data | No Data | + |
| snowbrush ceanothus | No Data | No Data | 0 | No Data | No Data | + |
| creeping Oregon-grape | - | No Data | No Data | + | No Data | No Data |
| mountain snowberry | - | No Data | No Data | + | No Data | No Data |
| **PONDEROSA PINE SERIES** | | | | | | |
| common snowberry | 0 | No Data | - | + | No Data | + |
| birchleaf spiraea | 0 | No Data | No Data | 0 | No Data | No Data |
| creeping Oregon-grape | 0 | No Data | No Data | 0 | No Data | No Data |
| **SHRUBLANDS** | | | | | | |
| ninebark | No Data | No Data | - | No Data | No Data | + |
| common snowberry | No Data | - | - | No Data | + | - |
| birchleaf spiraea | No Data | No Data | + | No Data | No Data | - |
| mountain big sagebrush | No Data | - | - | No Data | + | + |
| mountain mahogany | No Data | 0 | - | No Data | 0 | - |
| mountain snowberry | No Data | 0 | - | No Data | 0 | + |
| rabbitbrushes | No Data | 0 | - | No Data | + | + |

| HERBACEOUS VEGETATION | 1st Year | | | 5th Year | | |
|---|---|---|---|---|---|---|
| | Light | Moderate | Severe | Light | Moderate | Severe |
| **SUBALPINE FIR SERIES** | | | | | | |
| heartleaf arnica | No Data | + | + | No Data | + | + |
| skunk-leaved polemonium | No Data | 0 | - | No Data | + | + |
| Sitka valerian | No Data | 0 | - | No Data | + | - |
| round leaved violet | No Data | 0 | 0 | No Data | + | 0 |
| pearly everlasting | No Data | 0 | 0 | No Data | + | + |
| fireweeds | No Data | 0 | + | No Data | + | + |
| sidebells pyrola | No Data | - | - | No Data | - | - |
| **GRAND FIR SERIES (cool,moist)** | | | | | | |
| pinegrass | No Data | 0 | + | No Data | + | 0 |
| Ross' sedge | - | + | No Data | No Data | - | No Data |
| elk sedge | No Data | + | 0 | No Data | 0 | + |
| strawberries | - | - | + | No Data | + | + |
| round-leaved violet | No Data | - | No Data | No Data | - | No Data |
| fireweeds | + | 0 | + | No Data | + | 0 |
| heartleaf arnica | No Data | No Data | - | No Data | No Data | - |
| sidebells pyrola | - | No Data | - | No Data | No Data | 0 |
| **GRAND FIR SERIES (warm,dry)** | | | | | | |
| pinegrass | No Data | No Data | No Data | No Data | 0 | + |
| elk sedge | No Data | No Data | No Data | No Data | + | + |
| mountain brome | No Data | No Data | No Data | No Data | + | + |
| annual bromes | No Data | No Data | No Data | No Data | No Data | + |
| western fescue | No Data | No Data | No Data | No Data | + | + |
| western yarrow | No Data | No Data | No Data | No Data | + | + |
| bull thistle | No Data | No Data | No Data | No Data | + | + |
| fireweeds | No Data | No Data | No Data | No Data | No Data | + |
| strawberries | No Data | No Data | No Data | No Data | + | + |
| lupines | No Data | No Data | No Data | No Data | No Data | + |
| **DOUGLAS-FIR SERIES** | | | | | | |
| pinegrass | - | - | - | + | + | + |
| elk sedge | 0 | + | - | + | 0 | - |
| western fescue | No Data | 0 | 0 | No Data | + | + |
| heartleaf arnica | - | - | - | + | + | 0 |
| strawberries | 0 | + | - | 0 | + | + |
| mitella | No Data | 0 | - | No Data | + | + |
| prickly lettuce | No Data | 0 | + | 0 | 0 | - |
| fireweeds | No Data | + | + | 0 | 0 | + |
| yarrow | 0 | 0 | 0 | + | + | + |
| cleavers | No Data | 0 | 0 | No Data | + | + |
| **PONDEROSA PINE SERIES** | | | | | | |
| pinegrass | No Data | No Data | No Data | + | No Data | + |
| Idaho fescue | No Data | No Data | No Data | + | No Data | + |
| annual bromes | No Data | No Data | No Data | + | No Data | + |
| fireweeds | No Data | No Data | No Data | + | No Data | + |
| yarrow | No Data | No Data | No Data | 0 | No Data | + |
| prickly lettuce | No Data | No Data | No Data | No Data | No Data | 0 |
| lupines | No Data | No Data | No Data | 0 | No Data | No Data |

| HERBACEOUS VEGETATION, Con't. | 1st Year | | | 5th Year | | |
|---|---|---|---|---|---|---|
| | Light | Moderate | Severe | Light | Moderate | Severe |
| **SHRUBLANDS** | | | | | | |
| pinegrass | No Data | No Data | - | No Data | 0 | + |
| bluebunch wheatgrass | No Data | +/- | - | No Data | + | + |
| Idaho fescue | No Data | - | - | No Data | + | 0 |
| Kentucky bluegrass | No Data | 0 | No Data | No Data | 0 | No Data |
| mountain brome | No Data | + | + | No Data | 0 | No Data |
| annual bromes | No Data | + | + | No Data | + | + |
| western yarrow | No Data | + | + | No Data | - | - |
| heartleaf arnica | No Data | No Data | - | No Data | No Data | + |
| lupines | No Data | + | + | No Data | +/0 | No Data |
| creamy buckwheat | No Data | - | - | No Data | No Data | No Data |
| tumblemustard | No Data | - | + | No Data | 0 | - |
| miner's lettuce | No Data | 0 | 0 | No Data | + | + |
| yellow salsify | No Data | + | 0 | No Data | - | No Data |
| goatweed | No Data | - | No Data | No Data | + | No Data |
| **GRASSLANDS** | | | | | | |
| **BLUEBUNCH WHEATGRASS SERIES** | | | | | | |
| bluebunch wheatgrass | 0 | + | - | + | 0 | - |
| Sandberg's bluegrass | 0 | + | + | 0 | 0 | - |
| annual bromes | + | + | - | + | - | + |
| western yarrow | No Data | - | - | No Data | 0 | - |
| arrowleaf balsamroot | No Data | + | + | No Data | 0 | 0 |
| **IDAHO FESCUE SERIES** | | | | | | |
| Idaho fescue | 0 | - | -/0 | 0/+ | 0/- | +/- |
| bluebunch wheatgrass | - | -/+ | 0 | 0/+ | 0/- | 0/- |
| prairie junegrass | + | 0 | + | - | 0 | - |
| Sandberg's bluegrass | - | 0/+ | - | - | 0/- | 0 |
| annual bromes | + | 0 | 0 | +/- | -/+ | + |
| creamy buckwheat | - | - | No Data | 0 | + | No Data |
| western yarrow | 0/- | - | +/0 | 0/- | 0/+ | 0 |
| arrowleaf balsamroot | No Data | - | No Data | No Data | 0/- | No Data |
| lupine | - | 0/- | No Data | 0/+ | 0 | No Data |
| red avens | - | - | No Data | 0 | No Data | No Data |
| twin arnica | - | + | - | 0 | No Data | 0 |
| tall annual willowweed | No Data | 0 | 0 | No Data | + | + |
| prickly lettuce | No Data | 0 | + | No Data | 0 | + |